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Research Article

Amphibians and reptiles of the Transvolcanic Belt biogeographic province of Mexico: diversity, similarities, and conservation

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Abstract

The Transvolcanic Belt (TVB) of Mexico is a biogeographic province of significant biodiversity, acting as a transition zone between eastern and western Mexico. Using available literature, we collected species lists for amphibians and reptiles in Mexican states within the TVB biogeographic province, updating them with additional literature. The TVB is home to 427 native species of amphibians and reptiles, 154 amphibians and 273 reptiles, which represent 30.5% of the species of amphibians and reptiles in Mexico. The TVB also houses 50 endemic species, with 84 species listed by the IUCN. Threats include habitat destruction and pollution. The TVB shares a significant portion of its amphibian and reptile species with neighboring provinces, particularly the Sierra Madre Oriental and the Sierra Madre del Sur, suggesting a mixture of species from both eastern and western Mexico. Cluster analyses based on species composition reveal distinct groupings of provinces, with the TVB forming a cluster with the Sierra Madre Oriental, Veracruzan, and Sierra Madre del Sur for both amphibians and reptiles. Conservation assessments indicate that a significant proportion of the amphibian and reptile species in the TVB are at risk, primarily due to habitat loss from urbanization, agriculture, and pollution. Urgent conservation actions are needed to protect the unique herpetofauna of the TVB from further decline.

Key words: Amphibians, biogeographic province, conservation, herpetofauna, reptiles, species richness, Transvolcanic Belt

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Introduction

The Transvolcanic Belt (TVB) is the highest mountain range in Mexico, extending from west-central Veracruz, through Tlaxcala, Puebla, Morelos, Mexico City, state of Mexico, northern Guerrero, Michoacán, Colima, Jalisco and central Nayarit (Ferrari et al. 2012). The TVB divides Mexico into a northern and southern half, and is home to an impressive biodiversity due to its contact with the biogeographic provinces of eastern and western Mexico: Veracruzan and Sierra Madre Oriental in the east and Pacific Lowlands and Sierra Madre Occidental in the west. Likewise, the TVB acts as a barrier preventing the exchange of species from northern provinces, such as the Chihuahuan Desert, and southern provinces, such as the Balsas Basin and Sierra Madre del Sur (Morrone 2019). The

location of the TVB adjacent to provinces that differ in their biotas results in a diverse mix of species with Neotropical and Nearctic affinities. The TVB is therefore considered a transitional biogeographic province (Morrone et al. 2017) that connects three other transition provinces, the Sierra Madre Occidental, Sierra Madre Oriental, and Sierra Madre del Sur, representing the core of the Mexican Transition Zone (Espinosa and Ocegueda 2007; Halffter and Morrone 2017). In addition, the rugged topography of the TVB, which houses the highest mountains in Mexico with several surpassing 3,000 m, provides the TVB with unique alpine environments, absent from other Mexican biogeographic provinces, and providing it with a unique assortment of species. Several of the volcanoes found in the TVB are of recent origin, the youngest being the Paricutín which originated on 20 February 1943, and many are still active, resulting in this province being commonly known as the Neovolcanic Axis (Yarza De la Torre 2003).

The intense volcanic and orogenic activity in the TVB has resulted in the formation of many fluvial deposits; with soils in this biogeographic province able to retain water (Pangea 2023). Thus, forests act as rain traps, contributing to the refilling of underground aquifers (Pangea 2023). The climate is mostly temperate, and humidity levels vary according to altitude. Pine forests in the TVB grow at elevations of 2,275–2,600 masl, pine-oak forests at 2,470–2,600 masl, pine-cedar forests at more than 2,700 masl, and pine-fir forests above 3,000 masl (Pangea 2023). This province is important for its high biodiversity and number of endemic species, because its mountains probably served as a refuge for Nearctic species that were forced to migrate to temperate areas when the Chihuahuan Desert became drier and hotter during the Pleistocene (Pangea 2023). The diversity of terrestrial vertebrates that inhabit the TVB is notable including 703 bird species (Lepage 2023), and 152 species of mammals (Gámez et al. 2012).

The TVB is also home to several of the country's largest cities, including Mexico City, which together with the metropolitan area found in the state of Mexico forms the most populated region of Mexico. Very close to this large city, to the southwest, south, and north-northeast, are the cities of Toluca, Cuernavaca, and Pachuca. Together with the metropolitan area of Mexico City, these cities are continuing to grow and expand with devastating consequences for the natural resources of the region, especially flora and fauna of the central part of the TVB, including amphibians and reptiles (Lemos-Espinal and Smith 2020b). The expansion of these urban areas has caused the loss of habitat that is considered one of the main threats facing the herpetofauna of the region (IUCN 2022). Indeed, there are species in Mexico City that are known only from their original records (e.g., *Geophis bicolor* and *Geophis petersi*), or whose conservation status is quite tenuous (e.g., *Eleutherodactylus grandis*, *Rana tlaloci*, and *Ambystoma mexicanum*) (Lemos-Espinal and Smith 2020b).

Here we provide a list of the species of amphibians and reptiles found in the TVB, as well as summarizing the conservation status and their similarity with neighboring biogeographic provinces.

Physiographic characteristics

The TVB comprises a total area of 82,840 km^2, a perimeter of 5,750 km, a length of approximately 930 km, and an average width of 180 km. The TVB is located between 18.30605744° and 21.83918068° latitude and -96.70389784° and

-105.1007273° longitude. The TVB contains the highest mountains in Mexico, including Citlaltépetl (5,610 m), Popocatépetl (5,400 m), Iztaccíhuatl (5,215 m), Nevado de Toluca (4,680 m), Malinche (4,420 m), Nevado de Colima (4,260 m), and Ajusco (3,930 m). To the north, the TVB is bordered by the Chihuahuan Desert (border length = 1,488 km), the Sierra Madre Oriental (border length = 307 km), and the Veracruzan (border length = 281 km), the Balsas Basin (border length = 1,968 km) and the Sierra Madre del Sur (border length = 434 km) to the south, and the Pacific Lowlands (border length = 1,272 km) to the west (Fig. 1). Although the main characteristic of this province is its high mountains and volcanoes, they are separated by large flat areas in the form of intermontane valleys and plains, through which rivers, fed by the montane runoff, run and form closed basins leading to lakes, some of which are located in the cones of extinct volcanoes, such as those in the region of Alchichica, Puebla, and the Lago de la Luna, in the Nevado de Toluca.

One of the most important valleys in this province is the Valley of Mexico, where the metropolitan area of the state of Mexico and Mexico City is located, surrounded by the Sierra Nevada to the east, the Sierra del Ajusco in the south, the Sierra de las Cruces in the west, and the Sierra de Guadalupe in the north. Other important valleys are home to large cities such as the valleys of Puebla and Toluca. The geological history of the TVB, its topography and varied biotic connections with other biogeographic provinces makes it one of the most complex and heterogeneous provinces in Mexico (Gámez et al. 2012).

The climate of the TVB is varied and depends on its location with respect to the coasts and the height of the relief. In coastal regions, at altitudes < 800 masl, where oceanic humidity has a direct influence, the climate is semi-warm with heavy precipitation rate, and with an average annual temperature between 18 and 22 °C (García 2004). From 800 masl to approximately 2,000 masl, the climate within the TVB changes to temperate-humid, with an average annual temperature lower than 18 °C and annual precipitation reaching up to 4,500 mm, but the average annual precipitation in most of this altitudinal range is 2,500 mm. At altitudes > 2,000 masl, the climate is temperate-semi-cold with an average annual temperature of 8 °C and an average annual precipitation commonly < 1,200 mm. The cold tundra climate occurs between 4,000 and 5,100 m and with temperatures ranging between -2 and 5 °C. The coldest climate, with perpetual snow, is located at approximately 5,100 masl, with an average annual temperature below -2 °C. On the other hand, in the high plains in central of the TVB and far from oceanic influence, the climate is mostly temperate with an average annual temperature of 18 to 22 °C, with less precipitation compared to the mountain areas. In the central plateaus there are also large areas that have dry steppe climates; in part due to the katabatic winds that give rise to the Föhn effect in regions adjacent to mountain areas (Fig. 2; Soto Molina et al. 2021).

The topographic and climatic variety of the TVB determines the presence of a wide variety of vegetation types which, like climate, are related to the altitude at which they are found. The semi-warm climates near the Gulf coast promote the presence of mountain cloud forest and deciduous forest, and on the Pacific coast, tropical deciduous forest. These forests generally occur between 800 and 2,000 masl. The largest proportion of the central part of the TVB above 2,000 masl is occupied by oak and coniferous forests, with the pine-oak association

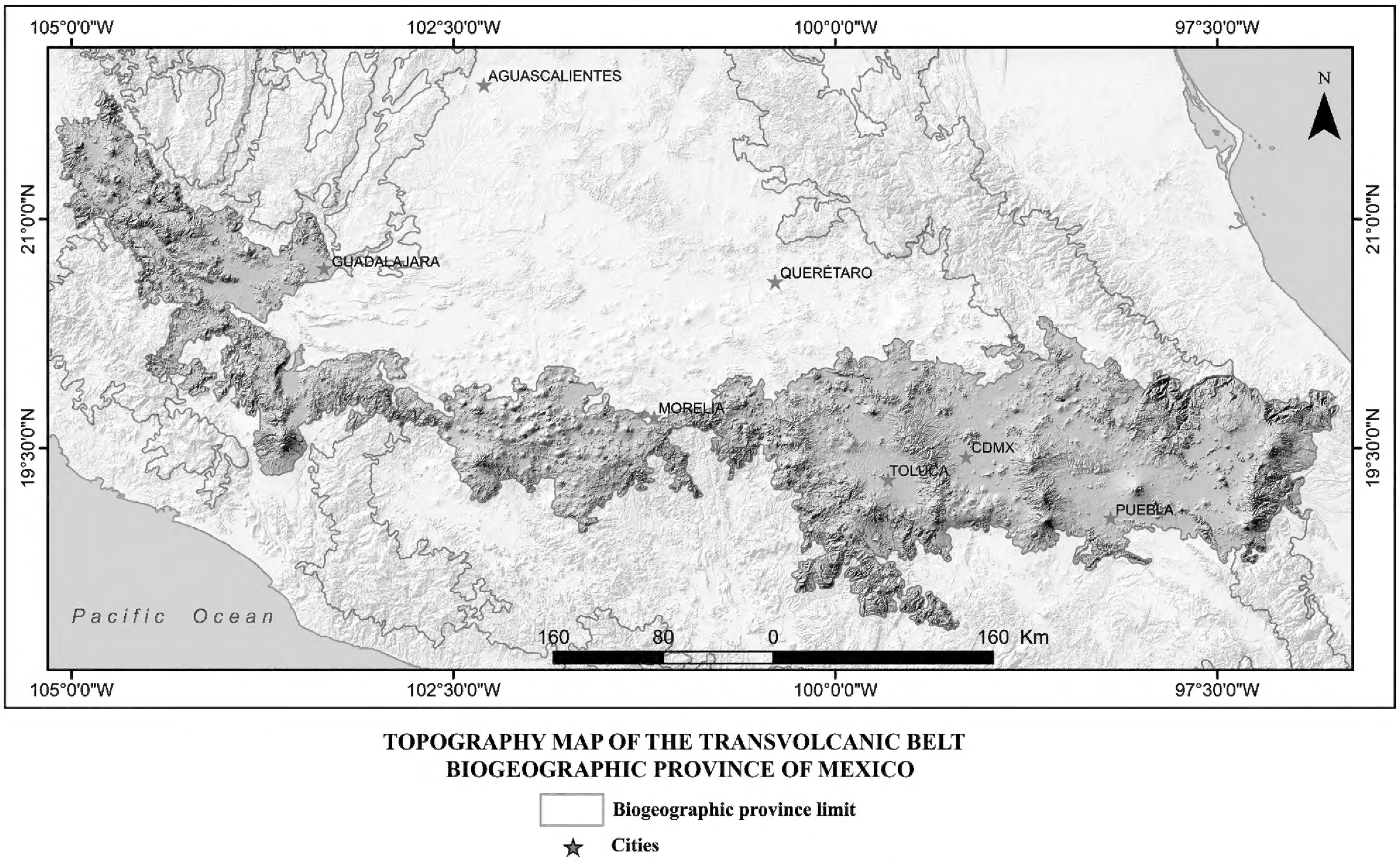

Figure 1. Topography map of the TVB biogeographic province of Mexico. (ASTER GDEM2 2011).

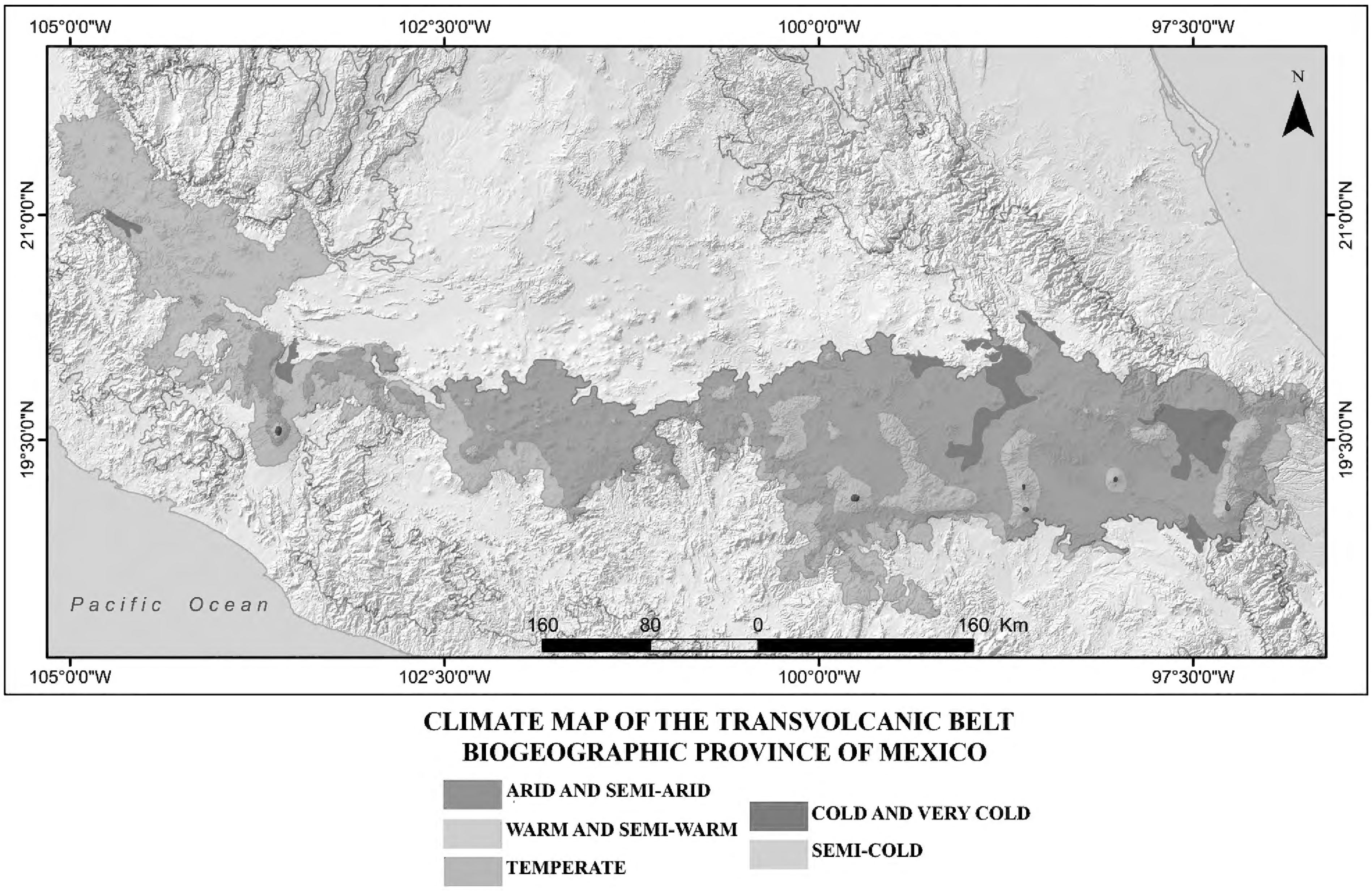

Figure 2. Climate map of the TVB biogeographic province of Mexico. (García 1998).

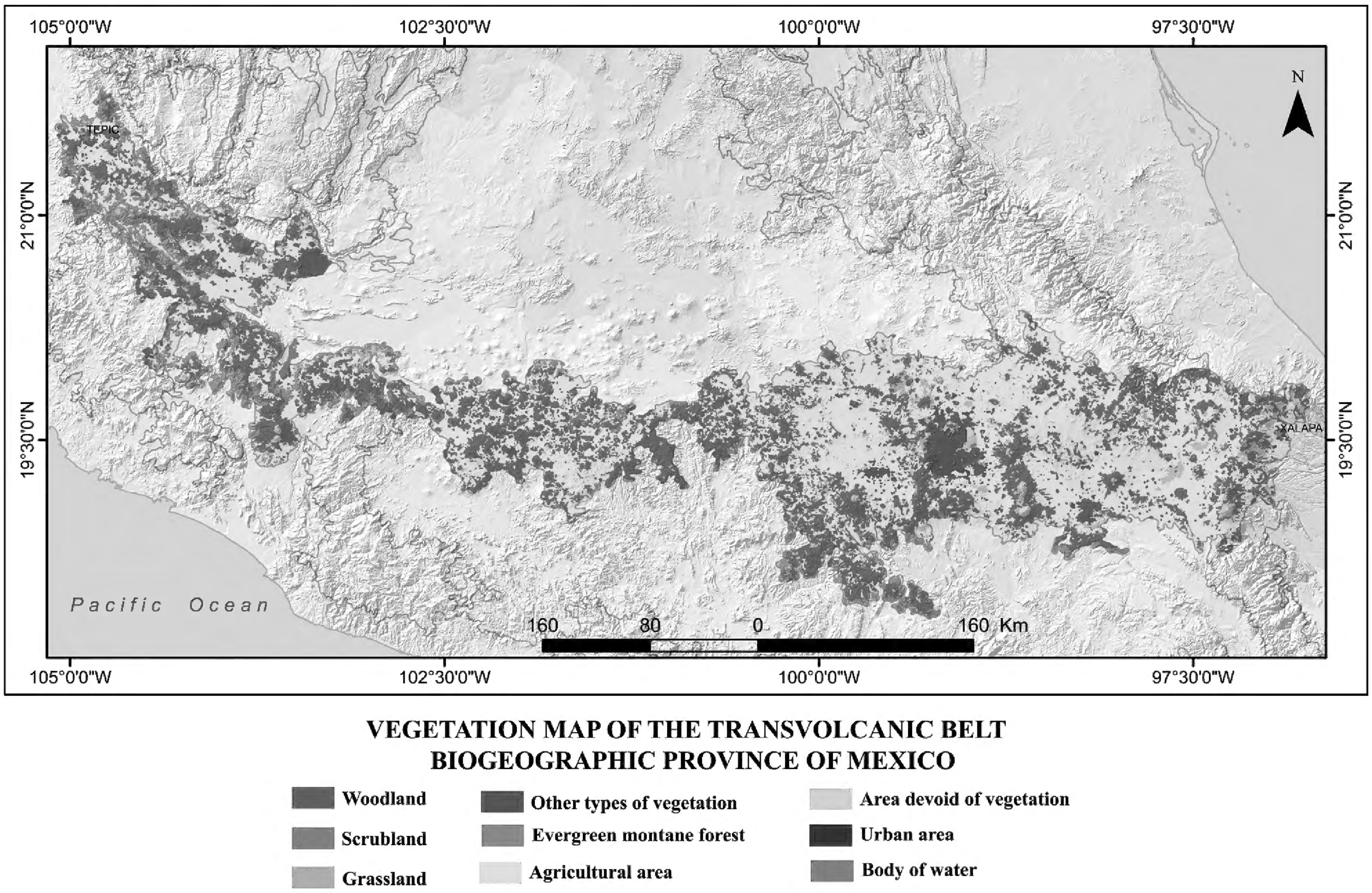

Figure 3. Vegetation map of the TVB biogeographic province of Mexico. (INEGI 2016).

predominating. Oak forests dominate below 2,200 masl, above this altitude pine trees start to appear, and between 2,200 and 2,600 masl are mixed with oaks and higher with cedar, and above 3,000 masl there are pine-fir forests (Pangea 2023). Above 3,700 masl there are forests dominated by *Pinus* with continuous forests up to 4,019 masl and discontinuous forests up to 4,072 masl (Soto Molina et al. 2021). At a higher elevation there is a strip of alpine grassland composed of grasses of the genera *Agrostis*, *Bromus*, *Calamagrostis*, *Festuca*, and *Mühlenbergia* that reaches up to 4,800 masl (Fig. 3) (Rzedowski 1978).

The central part of the TVB is the most densely populated region of Mexico, and home to around 30 million people. Cities such as Mexico City, Toluca, and Cuernavaca make up a large megalopolis, which is located in a high mountainous area that houses a total of 36 federal protected natural areas and more than one hundred state protected natural areas (Deutsche Gesellschaft für Internationale Zusammenarbeit 2023). Furthermore, east of the Valley of Mexico, several cities of the state of Puebla are rapidly growing, threatening important federal protected areas such as the Iztaccíhuatl – Popocatépetl National Park, which is part of the Sierra Nevada Mountain range to the east of the Valley of Mexico.

Methods

Using the available literature, we collected species lists of the amphibians and reptiles found in all of the Mexican states included in the Transvolcanic Belt (TVB) biogeographic province, that we updated using additional literature

(see Appendix 1). For the most part, we follow Frost (2024) and AmphibiaWeb (2024) (http://amphibiaweb.org) for amphibian names and Uetz et al. (2023) for reptile names. We defined the TVB biogeographic province according to Morrone (2005, 2006, 2019), and Morrone et al. (2017). We used hierarchical clustering analyses based on Jaccard's Similarity Coefficients for Binary Data as the distance metric with single linkages methods (nearest neighbor) to generate clusters of biogeographic provinces (TVB, Sierra Madre Oriental, Sierra Madre del Sur, Veracruzan, Pacific Lowlands, Balsas Basin, and Chihuahuan Desert) for amphibians and reptiles separately. We identified clusters and subclusters by visually examining the resulting cluster tree and grouping biogeographic provinces that shared common nodes, taking into account the Jaccard distances. We used the species lists to calculate pair-wise Jaccard distances for the seven neighboring biogeographic provinces for amphibians and reptiles, separately. In addition, we obtained four geospatial estimates using the map of biotic provinces of Mexico by Morrone et al. (2017) on a Lambert Conformal Conic projection in Datum WGS84 in ArcGIS 10.8.1 (Environmental Systems Research Institute, Inc, Redlands, CA): 1) the length of shared borders between the biogeographic provinces using the Polygon Neighbors Tool; 2) the straight-line distance between the centroids of the biogeographic provinces using the Feature to Point Tool and Point Distance; 3) the territorial area using the Calculate Geometry Tool; and 4) the perimeter of each biogeographic province also using the Calculate Geometry Tool. We also determined the latitudinal and longitudinal extremes of each biogeographic province, using the layer properties option. We used non-parametric Spearman's r tests to examine correlations among Jaccard distance estimates, the length of shared borders, and the distance between the centroids of the biogeographic provinces. Cluster analyses were performed using Systat 13.2 (Systat Software Inc., San Jose, CA) and all other statistical analyses were performed using JMP 16.2 (SAS Institute, Cary, NC).

Results and discussion

Species richness

The TVB is home to 427 native species of amphibians and reptiles, 154 amphibians and 273 reptiles, representing 40 families, 13 of amphibians (10 anurans, two salamanders, and one caecilid) and 27 reptiles (15 lizards, nine snakes, and three turtles), and 123 genera (35 amphibians and 88 reptiles) (Tables 1, 2). According to Lemos-Espinal and Smith (unpublished data), the total number of native amphibian and reptile species in Mexico is 1,399 (435 amphibians and 964 reptiles), included in 55 families (16 amphibians and 39 reptiles) and 210 genera (55 amphibians and 155 reptiles), which are similar to those reported by Ramírez-Bautista et al. (2023). Therefore, the TVB is home to 72.7% (40/55) of the families, 79.4% (123/155) of the genera, and 30.5% (427/1,399) of the species of amphibians and reptiles present in the country. For amphibians, the TVB is home to 81.3% (13/16) of the families, 70.9% (39/55) of the genera, and 35.4% (154/435) of the species that inhabit Mexico, and for reptiles 69.2% (27/39), 56.8% (88/155), and 28.3% (273/964) of the species in Mexico.

Table 1. Amphibians and reptiles of Transvolcanic Belt (TVB) biogeographic province of Mexico with distributional and conservation status. IUCN Status: (DD = Data Deficient; LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered; NE = not Evaluated) according to the IUCN Red List (IUCN 2022-2); Environmental Vulnerability Score: (EVS – the higher the score the greater the vulnerability: low (L) vulnerability species (EVS of 3–9); medium (M) vulnerability species (EVS of 10–13); and high (H) vulnerability species (EVS of 14–20) (Wilson et al. 2013a,b; Johnson et al. 2015); Mx refers to conservation status in Mexico according to SEMARNAT (2019): (P = in danger of extinction, A = threatened, Pr = subject to special protection, NL – not listed). Gl refers to Global Distribution: 0 = Endemic to the TVB; 1 = Endemic to Mexico; 2 = Shared between the US and Mexico; 3 = widely distributed from Mexico to Central or South America; 4 = widely distributed from the US to Central or South America; Introduced = Introduced to the TVB. Tot: total number of Mexican biogeographic provinces in which the species has been recorded; EN = endemic to the TVB.

	IUCN	EVS	Mx	Gl	Tot
Class Amphibia					
Order Anura					
Bufonidae					
Anaxyrus compactilis (Wiegmann, 1833)	LC (?)	H (14)	NL	1	6
Anaxyrus punctatus (Baird & Girard, 1852)	LC (−)	L (5)	NL	2	10
Incilius cristatus (Wiegmann, 1833)	EN (↓)	H (14)	Pr	1	3
Incilius marmoreus (Wiegmann, 1833)	LC (=)	M (11)	NL	1	8
Incilius mazatlanensis (Taylor, 1940)	LC (=)	M (12)	NL	1	5
Incilius nebulifer (Girard, 1854)	LC (=)	L (6)	NL	2	4
Incilius occidentalis (Camerano, 1879)	LC (=)	M (11)	NL	1	7
Incilius valliceps (Wiegmann, 1833)	LC (=)	L (6)	NL	3	9
Rhinella horribilis (Wiegmann, 1833)	NE	L (3)	NL	4	12
Centrolenidae					
Hyalinobatrachium viridissimum (Taylor, 1942)	NE	M (10)	NL	3	6
Craugastoridae					
Craugastor alfredi (Boulenger, 1898)	LC (↓)	M (11)	NL	3	4
Craugastor augusti (Dugès, 1879)	LC (=)	L (8)	NL	2	9
Craugastor berkenbuschii (Peters, 1870)	LC (?)	H (14)	Pr	1	4
Craugastor cueyatl Jameson, Streicher, Manuelli, Head & Smith, 2022	NE	NE	NL	0	EN
Craugastor decoratus (Taylor, 1942)	LC (=)	H (15)	NL	1	4
Craugastor hobartsmithi (Taylor, 1937)	LC (=)	H (15)	NL	1	5
Craugastor loki (Shannon & Werler, 1955)	LC (=)	M (10)	NL	3	7
Craugastor mexicanus (Brocchi, 1877)	LC (=)	H (16)	NL	1	5
Craugastor occidentalis (Taylor, 1941)	LC (=)	M (13)	NL	1	6
Craugastor pygmaeus (Taylor, 1937)	LC (?)	L (9)	NL	3	7
Craugastor rhodopis (Cope, 1867)	LC (=)	H (14)	NL	1	4
Craugastor spatulatus (Smith, 1939)	EN (↓)	H (16)	Pr	1	3
Craugastor vocalis (Taylor, 1940)	LC (↓)	M (13)	NL	1	5
Eleutherodactylidae					
Eleutherodactylus angustidigitorum (Taylor, 1940)	LC (=)	H (17)	Pr	1	2
Eleutherodactylus cystignathoides (Cope, 1877)	LC (=)	M (12)	NL	1	4
Eleutherodactylus erendirae Grünwald, Reyes-Velasco, Franz-Chávez, Morales-Flores, Ahumada-Carrillo, Jones & Boissinot, 2018	EN (?)	NE	NL	0	EN
Eleutherodactylus floresvillelai Grünwald, Reyes-Velasco, Franz-Chávez, Morales-Flores, Ahumada-Carrillo, Jones & Boissinot, 2018	VU (?)	NE	NL	0	EN
Eleutherodactylus franzi Grünwald, Montaño-Ruvalcaba, Jones, Ahumada-Carrillo, Grünwald, Zheng, Strickland & Reyes-Velasco, 2023	NE	NE	NL	0	EN
Eleutherodactylus grandis (Dixon, 1957)	EN (↓)	H (18)	Pr	0	EN

	IUCN	EVS	Mx	GI	Tot
Eleutherodactylus guttilatus (Cope, 1879)	LC (?)	M (11)	NL	2	4
Eleutherodactylus humboldti Devitt, Tseng, Taylor-Adair, Koganti, Timugura & Cannatella, 2023	NE	NE	NL	0	EN
Eleutherodactylus jamesdixoni Devitt, Tseng, Taylor-Adair, Koganti, Timugura & Cannatella, 2023	NE	NE	NL	1	4
Eleutherodactylus leprus (Cope, 1879)	LC (=)	M (12)	NL	3	5
Eleutherodactylus longipes (Baird, 1869)	LC (?)	H (15)	NL	1	4
Eleutherodactylus maurus Hedges, 1989	VU (?)	H (17)	Pr	1	2
Eleutherodactylus modestus (Taylor, 1942)	LC (=)	H (16)	Pr	1	3
Eleutherodactylus nitidus (Peters, 1870)	LC (=)	M (12)	NL	1	5
Eleutherodactylus pallidus (Duellman, 1958)	LC (=)	H (17)	Pr	1	3
Eleutherodactylus planirostris (Cope, 1862)				IN	
Eleutherodactylus rufescens (Duellman & Dixon, 1959)	VU (↓)	H (17)	Pr	1	2
Eleutherodactylus teretistes (Duellman, 1958)	VU (?)	H (16)	NL	1	3
Eleutherodactylus verrucipes (Cope, 1885)	LC (=)	H (16)	Pr	1	5
Eleutherodactylus verruculatus (Peters, 1870)	DD (?)	H (18)	NL	1	2
Hylidae					
Bromeliohyla dendroscarta (Taylor, 1940)	EN (↓)	H (17)	Pr	1	4
Charadrahyla taeniopus (Günther, 1901)	VU (↓)	M (13)	A	1	2
Dendropsophus microcephalus (Cope, 1886)	LC (↑)	L (7)	NL	3	6
Dryophytes arenicolor (Cope, 1886)	LC (=)	L (7)	NL	2	8
Dryophytes euphorbiaceus (Günther, 1858)	LC (=)	M (13)	NL	1	4
Dryophytes eximius (Baird, 1854)	LC (=)	M (10)	NL	1	7
Dryophytes plicatus (Brocchi, 1877)	LC (=)	M (11)	A	1	3
Exerodonta smaragdina (Taylor, 1940)	LC (↓)	M (12)	Pr	1	6
Exerodonta sumichrasti Brocchi, 1879	LC (↓)	L (9)	NL	1	4
Megastomatohyla mixomaculata (Taylor, 1950)	EN (↓)	H (14)	A	1	3
Megastomatohyla nubicola (Duellman, 1964)	CR (?)	H (14)	A	1	2
Ptychohyla zophodes Campbell & Duellman, 2000	VU (↓)	M (13)	NL	1	3
Rheohyla miotympanum (Cope, 1863)	LC (=)	L (9)	NL	1	7
Sarcohyla arborescandens (Taylor, 1939)	NT (↓)	M (11)	Pr	1	3
Sarcohyla bistincta (Cope, 1877)	LC (↓)	L (9)	Pr	1	5
Sarcohyla floresi Kaplan, Heimes & Aguilar, 2020	VU (?)	NE	NL	1	2
Sarcohyla hapsa Campbell, Brodie, Caviedes-Solis, Nieto-Montes de Oca, Luja, Flores-Villela, García-Vázquez, Sarker & Wostl, 2018	LC (?)	NE	NL	1	5
Sarcohyla robertsorum (Taylor, 1940)	VU (↓)	M (13)	A	1	3
Sarcohyla siopela (Duellman, 1968)	CR (↓)	H (15)	NL	1	3
Scinax staufferi (Cope, 1865)	LC (=)	L (4)	NL	3	9
Smilisca baudinii (Duméril & Bibron, 1841)	LC (=)	L (3)	NL	4	11
Smilisca cyanosticta (Smith, 1953)	LC (=)	M (12)	NL	3	5
Smilisca fodiens (Boulenger, 1882)	LC (=)	L (8)	NL	2	7
Tlalocohyla godmani (Günther, 1901)	VU (↓)	M (13)	A	1	3
Tlalocohyla loquax (Gaige & Stuart, 1934)	LC (=)	L (7)	NL	3	6
Tlalocohyla picta (Günther, 1901)	LC (↑)	L (8)	NL	3	5
Tlalocohyla smithii (Boulenger, 1902)	LC (=)	M (11)	NL	1	6
Trachycephalus vermiculatus (Cope, 1877)	NE	L (4)	NL	3	8
Triprion spinosus (Steindachner, 1864)	NT (↓)	H (14)	NL	3	5
Triprion spatulatus Günther, 1882	LC (=)	M (13)	NL	1	5

	IUCN	EVS	Mx	GI	Tot
Leptodactylidae					
Leptodactylus fragilis (Brocchi, 1877)	LC (=)	L (5)	NL	4	10
Leptodactylus melanonotus (Hallowell, 1861)	LC (=)	L (6)	NL	3	11
Microhylidae					
Hypopachus ustus (Cope, 1866)	LC (=)	L (7)	Pr	3	8
Hypopachus variolosus (Cope, 1866)	LC (=)	L (4)	NL	4	11
Phyllomedusidae					
Agalychnis dacnicolor (Cope, 1864)	LC (↓)	M (11)	NL	1	5
Agalychnis moreletii (Duméril, 1853)	LC (↓)	M (13)	NL	1	6
Ranidae					
Rana berlandieri Baird, 1854	LC (=)	L (7)	Pr	2	9
Rana catesbeiana Shaw, 1802				IN	
Rana chichicuahutla Cuellar, Méndez de la Cruz & Villagrán-Santa Cruz, 1996	CR (↓)	H (15)	NL	0	EN
Rana dunni Zweifel, 1957	EN (↓)	H (14)	Pr	0	EN
Rana johni Blair, 1965	VU (↓)	H (14)	P	1	3
Rana magnaocularis Frost & Bagnara, 1976	LC (?)	M (12)	NL	1	6
Rana megapoda Taylor, 1942	NT (↓)	H (14)	Pr	1	5
Rana montezumae Baird, 1854	LC (↓)	M (13)	Pr	1	6
Rana neovolcanica Hillis & Frost, 1985	LC (=)	M (13)	A	1	6
Rana psilonota Webb, 2001	LC (?)	H (14)	NL	1	4
Rana spectabilis Hillis & Frost, 1985	LC (↓)	M (12)	NL	1	5
Rana tlaloci Hillis & Frost, 1985	CR (?)	H (15)	P	0	EN
Rana vaillanti Brocchi, 1877	LC (=)	L (9)	NL	3	6
Rana zweifeli Hillis, Frost & Webb, 1984	LC (=)	M (11)	NL	1	3
Rana forreri Boulenger, 1883	LC (=)	L (3)	Pr	3	8
Rana pustulosa Boulenger, 1883	LC (=)	L (9)	Pr	1	5
Scaphiopodidae					
Scaphiopus couchi Baird, 1854	LC (=)	L (3)	NL	2	10
Spea multiplicata (Cope, 1863)	LC (=)	L (6)	NL	2	9
Order Caudata					
Ambystomatidae					
Ambystoma altamirani Dugès, 1895	EN (↓)	M (13)	A	0	EN
Ambystoma amblycephalum Taylor, 1940	CR (↓)	M (13)	Pr	0	EN
Ambystoma andersoni Krebs & Brandon, 1984	CR (↓)	H (15)	Pr	0	EN
Ambystoma bombypellum Taylor, 1940	DD (?)	H (15)	Pr	0	EN
Ambystoma dumerilii (Dugès, 1870)	CR (↓)	H (15)	Pr	0	EN
Ambystoma granulosum Taylor, 1944	EN (↓)	H (14)	Pr	0	EN
Ambystoma leorae (Taylor, 1943)	CR (↓)	H (15)	A	0	EN
Ambystoma lermaense (Taylor, 1940)	EN (↓)	H (15)	Pr	0	EN
Ambystoma mexicanum (Shaw & Nodder, 1798)	CR (↓)	H (15)	P	0	EN
Ambystoma ordinarium Taylor, 1940	EN (↓)	M (13)	Pr	0	EN
Ambystoma rivulare (Taylor, 1940)	EN (↓)	M (13)	A	0	EN
Ambystoma taylori Brandon, Maruska & Rumph, 1982	CR (?)	H (15)	Pr	0	EN
Ambystoma velasci (Dugès, 1888)	LC (?)	M (10)	Pr	1	6
Plethodontidae					
Aquiloeurycea cafetalera (Parra-Olea, Rovito, Márquez-Valdelmar, Cruz, Murrieta-Galindo & Wake, 2010)	VU (=)	H (14)	Pr	1	2

	IUCN	EVS	Mx	GI	Tot
Aquiloeurycea cephalica (Cope, 1865)	LC (↓)	H (17)	NL	1	3
Aquiloeurycea praecellens (Rabb, 1955)	CR (↓)	H (18)	A	1	2
Aquiloeurycea quetzalanensis (Parra-Olea, Canseco-Márquez & García-París, 2004)	CR (↓)	H (17)	NL	1	2
Bolitoglossa mexicana Duméril, Bibron & Duméril, 1854	LC (↓)	M (11)	Pr	3	5
Bolitoglossa platydactyla (Gray, 1831)	LC (=)	H (15)	Pr	1	4
Bolitoglossa rufescens (Cope, 1869)	LC (=)	L (9)	Pr	3	5
Chiropterotriton arboreus (Taylor, 1941)	CR (↓)	H (18)	Pr	1	2
Chiropterotriton casasi Parra-Olea, García-Castillo, Rovito, Maisano, Hanken & Wake, 2020	CR (↓)	NE	NL	0	EN
Chiropterotriton ceronorum Parra-Olea, García-Castillo, Rovito, Maisano, Hanken & Wake, 2020	CR (↓)	NE	NL	0	EN
Chiropterotriton chico García-Castillo, Rovito, Wake & Parra-Olea, 2017	VU (=)	NE	NL	0	EN
Chiropterotriton chiropterus (Cope, 1863)	CR (↓)	H (16)	Pr	1	2
Chiropterotriton chondrostega (Taylor, 1941)	EN (↓)	H (17)	Pr	1	3
Chiropterotriton cracens Rabb, 1958	VU (=)	H (17)	NL	1	2
Chiropterotriton lavae (Taylor, 1942)	CR (↓)	H (18)	Pr	0	EN
Chiropterotriton magnipes Raab, 1965	EN (↓)	H (16)	Pr	1	2
Chiropterotriton mosaueri (Woodall, 1941)	CR (?)	H (18)	Pr	1	3
Chiropterotriton multidentatus (Taylor, 1939)	EN (=)	H (15)	Pr	1	3
Chiropterotriton nubilus García-Castillo, Soto-Pozos, Aguilar-López, Pineda-Arredondo & Parra-Olea, 2018	CR (?)	NE	NL	0	EN
Chiropterotriton orculus (cope, 1865)	VU (↓)	H (18)	NL	1	2
Chiropterotriton perotensis Parra-Olea, García-Castillo, Rovito, Maisano, Hanken & Wake, 2020	CR (↓)	NE	NL	0	EN
Chiropterotriton terrestris (Taylor, 1941)	CR (?)	H (18)	NL	1	2
Chiropterotriton totonacus Parra-Olea, García-Castillo, Rovito, Maisano, Hanken & Wake, 2020	CR (↓)	NE	NL	0	EN
Isthmura belli (Gray, 1850)	LC (?)	M (12)	A	1	5
Isthmura corrugata Sandoval-Comte, Pineda-Arredondo, Rovito & Luría-Manzano, 2017	CR (?)	NE	NL	0	EN
Isthmura gigantea (Taylor, 1939)	EN (↓)	H (16)	NL	1	2
Isthmura naucampatepetl (Parra-Olea, Papenfuss & Wake, 2001)	CR (↓)	H (17)	NL	1	2
Parvimolge townsendi (Dunn, 1922)	VU (↓)	H (16)	A	1	2
Pseudoeurycea altamontana (Taylor, 1939)	EN (↓)	H (17)	Pr	0	EN
Pseudoeurycea firscheini Shannon & Werler, 1955	EN (↓)	H (18)	Pr	1	2
Pseudoeurycea gadovii (Dunn, 1926)	VU (↓)	M (13)	Pr	1	2
Pseudoeurycea granitum García-Bañuelos, Aguilar-López, Kelly-Hernandez, Vásquez-Cruz, Pineda-Arredondo & Rovito, 2020	NE	NE	NL	1	2
Pseudoeurycea leprosa (Cope, 1869)	LC (↓)	H (16)	A	1	3
Pseudoeurycea lineola (Cope, 1865)	EN (↓)	H (14)	Pr	1	3
Pseudoeurycea longicauda Lynch, Wake & Yang, 1983	EN (↓)	H (17)	Pr	0	EN
Pseudoeurycea lynchi Parra-Olea, Papenfuss & Wake, 2001	EN (↓)	H (17)	NL	1	2
Pseudoeurycea melanomolga (Taylor, 1941)	EN (↓)	H (16)	Pr	1	2
Pseudoeurycea nigromaculata (Taylor, 1941)	EN (↓)	H (17)	Pr	1	3
Pseudoeurycea robertsi (Taylor, 1939)	CR (↓)	H (18)	A	0	EN
Pseudoeurycea tlilicxitl Lara-Góngora, 2003	EN (?)	H (17)	NL	0	EN
Thorius dubitus Taylor, 1941	CR (↓)	H (16)	Pr	1	2
Thorius pennatulus Cope, 1869	EN (↓)	H (15)	Pr	1	3

	IUCN	EVS	Mx	GI	Tot
Thorius spilogaster Hanken & Wake, 1998	CR (↓)	H (17)	NL	0	EN
Thorius troglodytes Taylor, 1941	EN (↓)	H (16)	Pr	1	2
Order Gymnophiona					
Dermophiidae					
Dermophis mexicanus (Duméril & Bibron, 1841)	LC (↓)	M (11)	Pr	3	4
Dermophis oaxacae (Mertens, 1930)	LC (=)	M (12)	Pr	1	4
Class Reptilia					
Order Squamata					
Suborder Lacertilia					
Anguidae					
Abronia antauges (Cope, 1866)	NE	H (16)	Pr	1	2
Abronia deppii (Wiegmann, 1828)	EN (↓)	H (16)	A	0	EN
Abronia graminea (Cope, 1864)	EN (↓)	H (15)	A	1	3
Abronia taeniata (Wiegmann, 1828)	VU (↓)	H (15)	Pr	1	4
Barisia herrerae Zaldivar-Riverón & Nieto Montes de Oca, 2002	EN (↓)	H (15)	NL	0	EN
Barisia rudicollis (Wiegmann, 1828)	EN (=)	H (15)	P	0	EN
Barisia imbricata (Wiegmann, 1828)	LC (?)	H (14)	Pr	1	5
Elgaria kingii Gray, 1838	LC (=)	M (10)	Pr	2	5
Gerrhonotus infernalis Baird, 1859	LC (=)	M (13)	NL	2	4
Gerrhonotus ophiurus Cope, 1867	LC (?)	M (12)	NL	1	4
Gerrhonotus liocephalus Wiegmann, 1828	LC (=)	L (6)	Pr	4	9
Ophisaurus incomptus McConkey, 1955	NE	H (15)	P	1	3
Anolidae					
Anolis carlliebi Köhler, Trejo-Pérez, Petersen & Méndez de la Cruz, 2014	NE	H (15)	NL	1	4
Anolis cymbops Cope, 1864	LC (=)	H (17)	A	1	2
Anolis laeviventris (Wiegmann, 1834)	LC (=)	L (9)	NL	3	5
Anolis lemurinus Cope, 1861	LC (=)	L (8)	NL	3	5
Anolis nebulosus (Wiegmann, 1834)	LC (=)	M (13)	NL	1	6
Anolis petersii Bocourt, 1873	NT (↓)	L (9)	NL	3	5
Anolis schiedii (Wiegmann, 1834)	DD (?)	H (16)	Pr	1	2
Anolis sericeus Hallowell, 1856	LC (=)	L (8)	NL	3	6
Anolis tropidonotus Peters, 1863	LC (=)	L (9)	NL	3	6
Corytophanidae					
Basiliscus vittatus Wiegmann, 1828	LC (=)	L (7)	NL	3	8
Corytophanes hernandesii (Wiegmann, 1831)	LC (=)	M (13)	NL	3	5
Laemanctus longipes Wiegmann, 1834	LC (?)	L (9)	Pr	3	6
Dibamidae					
Anelytropsis papillosus Cope, 1885	LC (↓)	M (10)	A	1	4
Diploglossidae					
Celestus enneagrammus (Cope, 1861)	LC (=)	H (14)	Pr	1	5
Celestus legnotus Campbell & Camarillo, 1994	LC (=)	H (14)	NL	1	2
Eublepharidae					
Coleonyx elegans Gray, 1845	LC (=)	L (9)	A	3	8
Gekkonidae					
Gehyra mutilata (Wiegmann, 1834)				IN	
Hemidactylus mabouia (Moreau De Jonnés, 1818)				IN	

	IUCN	EVS	Mx	GI	Tot
Helodermatidae					
Heloderma horridum (Wiegmann, 1829)	LC (↓)	M (11)	A	3	6
Iguanidae					
Ctenosaura acanthura (Shaw, 1802)	LC (↓)	M (12)	Pr	3	7
Ctenosaura pectinata (Wiegmann, 1834)	LC (↓)	H (15)	A	1	7
Iguana iguana (Linnaeus, 1758)	LC (?)	M (12)	Pr	3	9
Phrynosomatidae					
Phrynosoma braconnieri Duméril & Bocourt, 1870	LC (=)	H (15)	Pr	1	4
Phrynosoma orbiculare (Linnaeus, 1766)	LC (=)	M (12)	A	1	6
Phrynosoma asio Cope, 1864	LC (=)	M (11)	Pr	3	5
Sceloporus aeneus Wiegmann, 1828	LC (=)	M (13)	NL	1	4
Sceloporus albiventris Smith, 1939	NE	H (16)	NL	1	3
Sceloporus anahuacus Lara-Góngora, 1983	LC (=)	H (15)	NL	0	EN
Sceloporus asper Boulenger, 1897	LC (↓)	H (14)	Pr	1	4
Sceloporus aureolus Smith, 1942	NE	H (15)	NL	1	4
Sceloporus bicanthalis Smith, 1937	LC (=)	M (13)	NL	1	3
Sceloporus bulleri Boulenger, 1894	LC (=)	H (15)	NL	1	4
Sceloporus clarkii Baird & Girard, 1852	LC (=)	M (10)	NL	2	5
Sceloporus dixoni Bryson & Grummer, 2021	NE	NE	NL	0	EN
Sceloporus formosus Wiegmann, 1834	LC (=)	H (15)	NL	1	4
Sceloporus grammicus Wiegmann, 1828	LC (=)	L (9)	Pr	2	8
Sceloporus heterolepis Boulenger, 1895	LC (?)	H (14)	NL	1	5
Sceloporus huichol Flores-Villela, Smith, Campillo-García, Martínez-Méndez & Campbell, 2022	NE	NE	NL	1	2
Sceloporus insignis Webb, 1967	LC (=)	H (16)	Pr	1	2
Sceloporus internasalis Smith & Bumzahem, 1955	LC (↓)	M (11)	NL	3	4
Sceloporus jalapae Gúnther, 1890	LC (=)	M (13)	NL	1	4
Sceloporus megalepidurus Smith, 1934	VU (↓)	H (14)	Pr	1	5
Sceloporus melanogaster Cope, 1885	NE	NE	NL	1	3
Sceloporus melanorhinus Bocourt, 1876	LC (=)	L (9)	NL	3	6
Sceloporus minor Cope, 1885	LC (=)	H (14)	NL	1	3
Sceloporus mucronatus Cope, 1885	LC (=)	M (13)	NL	1	3
Sceloporus nelsoni Cochran, 1923	LC (=)	M (13)	NL	1	4
Sceloporus ochoterenae Smith, 1934	LC (=)	M (12)	NL	1	3
Sceloporus palaciosi Lara-Góngora, 1983	LC (=)	H (15)	NL	0	EN
Sceloporus salvini Gúnther, 1890	DD (?)	H (15)	A	1	4
Sceloporus scalaris Wiegmann, 1828	LC (=)	M (12)	NL	1	6
Sceloporus serrifer Cope, 1866	LC (=)	L (6)	NL	3	5
Sceloporus spinosus Weigmann, 1828	LC (=)	M (12)	NL	1	7
Sceloporus subniger Poglayen & Smith, 1958	NE	NE	NL	0	EN
Sceloporus teapensis Günther, 1890	LC (=)	M (13)	NL	3	5
Sceloporus torquatus Wiegmann, 1828	LC (=)	M (11)	NL	1	4
Sceloporus unicanthalis Smith, 1937	NE	H (16)	NL	1	4
Sceloporus variabilis Wiegmann, 1834	LC (=)	L (5)	NL	2	7
Sceloporus dugesii Bocourt, 1874	LC (=)	M (13)	NL	1	4
Sceloporus horridus Wiegmann, 1834	LC (=)	M (11)	NL	1	6
Sceloporus pyrocephalus Cope, 1864	LC (=)	M (12)	NL	1	4

	IUCN	EVS	Mx	GI	Tot
Sceloporus sugillatus Smith, 1942	LC (=)	H (16)	NL	0	EN
Sceloporus utiformis Cope, 1864	LC (=)	H (15)	NL	1	6
Urosaurus bicarinatus (Duméril, 1856)	LC (=)	M (12)	NL	1	7
Phyllodactylidae					
Phyllodactylus bordai Taylor, 1942	LC (=)	M (13)	Pr	1	3
Phyllodactylus davisi Dixon, 1964	LC (=)	H (16)	A	1	3
Phyllodactylus lanei Smith, 1935	LC (=)	H (15)	NL	1	5
Scincidae					
Marisora aquilonaria McCraine, Matthews & Hedges, 2020	NE	NE	NL	1	7
Marisora lineola McCranie, Matthews & Hedges, 2020	NE	NE	NL	3	6
Plestiodon brevirostris (Günther, 1860)	LC (=)	M (11)	NL	1	4
Plestiodon callicephalus (Bocourt, 1879)	LC (=)	M (12)	NL	2	4
Plestiodon colimensis (Taylor, 1935)	DD (?)	H (14)	Pr	1	3
Plestiodon copei (Taylor, 1933)	LC (=)	H (14)	Pr	1	3
Plestiodon dugesii (Thominot, 1883)	VU (↓)	H (16)	Pr	1	2
Plestiodon indubitus (Taylor, 1933)	NE	H (15)	NL	1	2
Plestiodon lynxe (Wiegmann, 1834)	LC (=)	M (10)	Pr	1	6
Plestiodon parvulus (Taylor, 1933)	DD (?)	H (15)	NL	1	4
Plestiodon sumichrasti (Cope, 1867)	LC (↓)	M (12)	NL	3	6
Scincella assata (Cope, 1864)	LC (=)	L (7)	NL	3	6
Scincella gemmingeri (Cope, 1864)	LC (=)	M (11)	Pr	1	7
Scincella silvicola (Taylor, 1937)	LC (=)	M (12)	A	1	5
Sphaerodactylidae					
Sphaerodactylus glaucus Cope, 1866	LC (=)	M (12)	Pr	3	6
Teiidae					
Aspidoscelis communis (Cope, 1878)	LC (=)	H (14)	Pr	1	4
Aspidoscelis costatus (Cope, 1878)	LC (=)	M (11)	Pr	1	8
Aspidoscelis deppii (Wiegmann, 1834)	LC (=)	L (8)	NL	3	7
Aspidoscelis gularis (Baird & Girard, 1852)	LC (=)	L (9)	NL	2	6
Aspidoscelis guttatus (Wiegmann, 1834)	LC (=)	M (12)	NL	1	7
Aspidoscelis lineattissimus (Cope, 1878)	LC (=)	H (14)	Pr	1	5
Holcosus amphigrammus (Smith & Laufe, 1945)	NE	M (11)	NL	1	7
Holcosus sinister (Wiegmann, 1834)	NE	M (13)	NL	1	4
Xantusidae					
Lepidophyma gaigeae Mosauer, 1936	VU (↓)	M (13)	Pr	1	4
Lepidophyma sylvaticum Taylor, 1939	LC (↓)	M (11)	Pr	1	3
Lepidophyma zongolica García-Vázquez, Canseco-Márquez & Aguilar-López, 2010	DD (?)	H (16)	NL	1	3
Xantusia sanchezi Bezy & Flores-Villela, 1999	LC (?)	H (16)	P	1	2
Xenosauridae					
Xenosaurus grandis (Gray, 1856)	VU (↓)	L (9)	Pr	1	5
Order Squamata					
Suborder Serpentes					
Boidae					
Boa imperator Daudin, 1803	LC (=)	M (10)	NL	3	9
Boa sigma (Smith, 1943)	NE	M (10)	NL	1	6

	IUCN	EVS	Mx	GI	Tot
Colubridae					
Conopsis acuta (Cope, 1886)	NE	H (14)	NL	1	5
Conopsis lineata (Kennicott, 1859)	LC (=)	M (13)	NL	1	5
Conopsis nasus (Günther, 1858)	LC (=)	M (11)	NL	1	5
Conopsis biserialis (Taylor & Smith, 1942)	LC (=)	M (13)	A	1	3
Drymarchon melanurus (Duméril, Bibron & Duméril, 1854)	LC (=)	L (6)	NL	4	12
Drymobius margaritiferus (Schlegel, 1837)	LC (=)	L (6)	NL	4	10
Ficimia olivacea Gray, 1849	LC (?)	L (9)	NL	1	3
Gyalopion canum Cope, 1861	LC (=)	L (9)	NL	2	4
Lampropeltis abnorma (Bocourt, 1886)	LC (=)	L (9)	NL	3	7
Lampropeltis mexicana (Garman, 1884)	LC (=)	H (15)	A	1	5
Lampropeltis ruthveni Blanchard, 1920	NT (↓)	H (16)	A	1	3
Lampropeltis polyzona Cope, 1860	LC (?)	M (11)	NL	1	9
Leptophis diplotropis (Günther, 1872)	LC (=)	H (14)	A	1	8
Leptophis mexicanus Duméril, Bibron & Duméril, 1854	LC (=)	L (6)	A	3	8
Masticophis bilineatus Jan, 1863	LC (=)	M (11)	NL	2	6
Masticophis flagellum Shaw, 1802	LC (=)	L (8)	A	2	9
Masticophis mentovarius (Duméril, Bibron & Duméril, 1854)	LC (?)	L (6)	A	3	11
Masticophis schotti Baird & Girard, 1853	LC (=)	M (13)	NL	2	5
Masticophis taeniatus (Hallowell, 1852)	LC (=)	M (10)	NL	2	3
Mastigodryas cliftoni (Hardy, 1964)	DD (?)	H (14)	NL	1	4
Mastigodryas melanolomus (Cope 1868)	LC (=)	L (6)	NL	3	8
Oxybelis fulgidus (Daudin, 1803)	LC (=)	L (9)	NL	3	6
Oxybelis microphthalmus Barbour & Amaral, 1926	NE	NE	NL	2	9
Pituophis deppei (Duméril, 1853)	LC (=)	H (14)	A	1	7
Pituophis lineaticollis (Cope, 1861)	LC (=)	L (8)	NL	3	5
Pseudoficimia frontalis (Cope, 1864)	LC (=)	M (13)	NL	1	7
Salvadora bairdii Jan & Sordelli, 1860	LC (=)	H (15)	Pr	1	8
Salvadora grahamiae Baird & Girard, 1853	LC (=)	M (10)	NL	2	6
Salvadora mexicana (Duméril, Bibron & Duméril, 1854)	LC (=)	H (15)	Pr	1	5
Scaphiodontophis annulatus (Duméril, Bibron & Duméril, 1854)	LC (=)	M (11)	NL	3	6
Senticolis triaspis (Cope, 1866)	LC (=)	L (6)	NL	4	11
Sonora michoacanensi (Dugès, 1884)	LC (=)	H (14)	NL	1	4
Sonora mutabilis Stickel, 1943	LC (?)	H (14)	NL	1	5
Spilotes pullatus (Linnaeus, 1758)	LC (=)	L (6)	NL	3	7
Stenorrhina degenhardtii (Berthold, 1846)	LC (=)	L (9)	NL	3	5
Stenorrhina freminvillei (Duméril, Bribon & Duméril, 1854)	LC (=)	L (7)	NL	3	7
Sympholis lippiens Cope, 1862	DD (?)	H (14)	NL	1	3
Tantilla bocourti (Günther, 1895)	LC (?)	L (9)	NL	1	8
Tantilla cascadae Wilson & Meyer, 1981	DD (?)	H (16)	A	1	2
Tantilla ceboruca Canseco-Márquez, Smith, Ponce-Campos, Flores-Villela & Campbell, 2007	NE	H (16)	NL	1	1
Tantilla deppei (Bocourt, 1883)	LC (?)	M (13)	A	1	3
Tantilla rubra Cope, 1875	LC (?)	L (5)	Pr	3	8
Tantilla schistosa (Bocourt, 1883)	LC (?)	L (8)	NL	3	7
Tantilla yaquia Smith, 1942	LC (=)	M (10)	NL	2	4
Tantilla calamarina Cope, 1866	LC (=)	M (12)	Pr	1	4

	IUCN	EVS	Mx	Gl	Tot
Tantillita lintoni (Smith, 1940)	LC (=)	M (12)	Pr	3	5
Trimorphodon paucimaculatus Taylor, 1936	NE	H (15)	NL	1	5
Trimorphodon tau Cope, 1870	LC (=)	M (13)	NL	1	8
Trimorphodon biscutatus (Duméril, Bibron & Duméril, 1854)	LC (=)	L (7)	NL	3	6
Dipsadidae					
Adelphicos quadrivirgatum Jan, 1862	LC (?)	M (10)	Pr	3	5
Amastridium sapperi Werner, 1903	LC (=)	M (10)	NL	3	5
Chersodromus liebmanni Reinhardt, 1861	LC (=)	M (12)	Pr	1	5
Clelia scytalina (Cope, 1867)	LC (=)	M (13)	NL	3	6
Coniophanes bipunctatus (Günther, 1858)	LC (=)	M (10)	NL	3	5
Coniophanes fissidens (Günther 1858)	LC (=)	L (7)	NL	3	7
Coniophanes imperialis (Baird & Girard, 1859)	LC (=)	M (8)	NL	4	8
Coniophanes taeniata (Peters, 1870)	NE	NE	NL	1	4
Coniophanes lateritius Cope, 1862	DD (?)	M (13)	NL	1	5
Conophis lineatus (Duméril Bribon & Duméril, 1854)	LC (=)	L (9)	NL	3	7
Conophis morai Pérez-Higareda, López-Luna & Smith, 2002	DD (?)	H (17)	NL	1	2
Conophis vittatus Peters, 1860	LC (=)	M (11)	NL	3	6
Diadophis punctatus (Linnaeus, 1766)	LC (=)	L (4)	NL	2	7
Enulius oligostichus Smith, Arndt & Sherbrook, 1967	DD (?)	H (15)	Pr	1	2
Geophis annuliferus (Boulenger, 1894)	LC (=)	M (13)	Pr	1	5
Geophis berillus Barragán-Reséndiz, Pavón-Vázquez, Cervantes-Burgos, Trujano-Ortega, Canseco-Márquez & García-Vázquez, 2022	NE	NE	NL	0	EN
Geophis bicolor Günther, 1868	DD (?)	H (15)	Pr	1	2
Geophis blanchardi Taylor & Smith, 1939	DD (?)	H (15)	Pr	1	3
Geophis dugesii Bocourt, 1883	LC (?)	M (13)	NL	1	3
Geophis juliai Pérez-Higareda, Smith & López-Luna, 2001	VU (↓)	M (13)	NL	1	2
Geophis lorancai Canseco-Márquez, Pavón-Vázquez, López-Luna & Nieto Montes de Oca, 2016	NE	H (14)	NL	1	2
Geophis maculiferus Taylor, 1941	DD (?)	H (16)	Pr	0	EN
Geophis mutitorques (Cope, 1865)	LC (=)	M (13)	Pr	1	3
Geophis petersii Boulenger, 1894	DD (?)	H (15)	Pr	1	3
Geophis sartorii (Cope, 1863)	LC (=)	L (9)	Pr	3	8
Geophis semidoliatus (Duméril, Bibron & Duméril, 1854)	LC (=)	M (13)	NL	1	5
Geophis sieboldi (Jan, 1862)	DD (?)	M (13)	Pr	1	3
Geophis tarascae Hartweg, 1959	DD (?)	H (15)	Pr	0	EN
Hypsiglena affinis Boulenger, 1894	NE	H (14)	Pr	1	3
Hypsiglena jani Dugès, 1866	LC (=)	L (6)	Pr	2	6
Hypsiglena tanzeri Dixon & Lieb, 1972	DD (?)	H (15)	NL	1	3
Hypsiglena torquata (Günther, 1860)	LC (=)	L (8)	Pr	1	5
Imantodes cenchoa (Linnaeus, 1758)	LC (=)	L (6)	Pr	3	7
Imantodes gemmistratus (Cope, 1861)	LC (=)	L (6)	Pr	3	8
Leptodeira punctata (Peters, 1866)	LC (?)	H (17)	NL	1	4
Leptodeira septentrionalis (Kennicott, 1859)	LC (=)	L (8)	NL	4	10
Leptodeira splendida Günther, 1895	LC (?)	H (14)	NL	1	6
Leptodeira maculata (Hallowell, 1861)	LC (=)	L (7)	Pr	1	9
Manolepis putnami (Jan, 1863)	LC (=)	M (13)	NL	1	6
Ninia diademata Baird & Girard, 1853	LC (=)	L (9)	NL	3	7

	IUCN	EVS	Mx	GI	Tot
Ninia sebae (Duméril, Bibron & Duméril, 1854)	LC (=)	L (5)	NL	3	6
Pliocercus elapoides Cope, 1860	LC (=)	M (10)	NL	3	7
Rhadinaea cuneata Myers, 1974	DD (?)	H (15)	Pr	1	4
Rhadinaea decorata (Günther, 1858)	LC (=)	L (9)	NL	3	5
Rhadinaea fulvivittis Cope, 1875	VU (↓)	M (11)	NL	1	4
Rhadinaea gaigeae Bailey, 1937	DD (?)	M (12)	NL	1	3
Rhadinaea hesperia Bailey, 1940	LC (=)	M (10)	Pr	1	7
Rhadinaea laureata (Günther, 1868)	LC (?)	M (12)	NL	1	3
Rhadinaea quinquelineata Cope, 1886	DD (?)	H (15)	Pr	1	4
Rhadinaea taeniata (Peters, 1863)	DD (?)	M (13)	NL	1	6
Sibon nebulatus (Linnaeus, 1758)	LC (=)	L (5)	NL	3	7
Tropidodipsas philippii (Jan, 1863)	LC (=)	H (14)	Pr	1	3
Elapidae					
Micruroides euryxanthus (Kennicott, 1860)	LC (=)	H (15)	A	2	3
Micrurus browni Schmidt & Smith, 1943	LC (=)	L (8)	Pr	3	6
Micrurus diastema (Duméril, Bibron & Duméril, 1854)	LC (=)	L (8)	Pr	3	6
Micrurus distans (Kennicott, 1860)	LC (=)	H (14)	Pr	1	7
Micrurus elegans Jan, 1858	LC (?)	M (13)	Pr	3	5
Micrurus laticollaris Peters, 1870	LC (=)	H (14)	Pr	1	4
Micrurus proximans Smith & Chrapliwy, 1958	LC (?)	H (18)	Pr	1	4
Micrurus tener (Baird & Girard, 1953)	LC (=)	M (11)	NL	2	5
Leptotyphlopidae					
Epictia bakewelli (Oliver, 1937)	NE	M (11)	NL	1	4
Rena bressoni (Taylor, 1939)	DD (?)	H (14)	Pr	1	2
Rena dulcis (Baird & Girard, 1853)	LC (?)	M (13)	NL	2	5
Rena humilis Baird &Girard, 1853	LC (=)	L (8)	NL	2	9
Rena maxima (Loveridge, 1932)	LC (=)	M (11)	NL	1	4
Loxocemidae					
Loxocemus bicolor Cope, 1861	LC (?)	M (10)	Pr	3	6
Natricidae					
Nerodia rhombifer (Hallowell, 1852)	LC (=)	M (10)	NL	4	6
Storeria dekayi (Holbrook, 1836)	LC (=)	L (7)	NL	4	5
Storeria storerioides (Cope, 1865)	LC (=)	M (11)	NL	1	6
Thamnophis chrysocephalus (Cope, 1885)	LC (=)	H (14)	A	1	4
Thamnophis copei Dugès, 1879	VU (↓)	H (15)	Pr	1	2
Thamnophis cyrtopsis (Kennicott, 1860)	LC (=)	L (7)	A	4	10
Thamnophis eques (Reuss, 1834)	LC (=)	L (8)	A	2	7
Thamnophis godmani (Günther, 1894)	LC (↓)	H (14)	A	1	4
Thamnophis marcianus (Baird & Girard, 1853)	LC (?)	M (10)	A	4	9
Thamnophis melanogaster (Peters, 1864)	EN (↓)	H (15)	A	1	5
Thamnophis proximus (Say, 1823)	LC (=)	L (7)	A	4	8
Thamnophis pulchrilatus (Cope, 1885)	LC (?)	H (15)	NL	1	6
Thamnophis rossmani Conant, 2000	DD (?)	H (18)	NL	0	EN
Thamnophis scalaris Cope, 1861	LC (=)	H (14)	A	1	3
Thamnophis scaliger (Jan, 1863)	VU (↓)	H (15)	A	1	4
Thamnophis sumichrasti (Cope, 1866)	LC (?)	H (15)	A	1	4
Thamnophis validus (Kennicott, 1860)	LC (=)	M (12)	NL	1	5

	IUCN	EVS	Mx	GI	Tot
Typhlopidae					
*Amerotyphlops tenuis (*Salvin, 1860)	LC (?)	M (11)	NL	3	4
Indotyphlops braminus (Daudin, 1803)				IN	
Viperidae					
Agkistrodon bilineatus (Günther, 1863)	NT (↓)	M (11)	Pr	3	6
Bothrops asper (Garman, 1883)	NE	M (12)	NL	3	6
Cerrophidion petlalcalensis López-Luna, Vogt & Torre-Loranca, 1999	DD (=)	H (18)	NL	1	3
Crotalus aquilus Klauber, 1952	LC (↓)	H (16)	Pr	1	4
Crotalus armstrongi Campbell, 1979	NE	H (18)	NL	0	EN
Crotalus atrox Baird & Girard, 1853	LC (=)	M (9)	Pr	2	9
Crotalus basiliscus (Cope, 1864)	LC (=)	H (16)	Pr	1	6
Crotalus campbelli Bryson, Linkem, Dorcas, Lathrop, Jones, Alvarado-Díaz, Grünwald & Murphy, 2014	NE	H (17)	NL	1	2
Crotalus culminatus Klauber, 1952	NE	H (15)	NL	1	4
Crotalus intermedius Troschel, 1865	LC (=)	H (15)	A	1	5
Crotalus lannomi Tanner, 1966	DD (?)	H (19)	A	1	3
Crotalus lepidus (Kennicott, 1861)	LC (=)	M (12)	Pr	2	4
Crotalus mictlantecuhtli Carbajal-Márquez, Cedeño-Vázquez, Martínez-Arce, Neri-Castro & Machkour-M´Rabet, 2020	NE	NE	NL	1	2
Crotalus molossus Baird & Girard, 1853	LC (=)	L (8)	Pr	2	8
Crotalus polystictus (Cope, 1865)	LC (↓)	H (16)	Pr	1	4
Crotalus pusillus Klauber, 1952	EN (?)	H (18)	A	1	2
Crotalus ravus Cope, 1865	LC (=)	H (14)	A	1	5
Crotalus scutulatus (Kennicott, 1861)	LC (=)	M (11)	Pr	2	7
Crotalus tancitarensis Alvarado-Díaz & Campbell, 2004	DD (?)	H (19)	NL	0	EN
Crotalus tlaloci Bryson, Linkem, Dorcas, Lathrop, Jones, Alvarado-Díaz, Grünwald & Murphy, 2014	NE	H (16)	NL	1	2
Crotalus totonacus Gloyd & Kauffeld, 1940	LC (=)	H (17)	NL	1	4
Crotalus transversus Taylor, 1944	LC (=)	H (17)	P	0	EN
Crotalus triseriatus (Wagler, 1830)	LC (=)	H (16)	NL	1	3
Metlapilcoatlus nummifer (Rüppell, 1845)	NE	M (13)	A	1	5
Ophryacus smaragdinus Grünwald, Jones, Franz-Chávez & Ahumada-Carrillo, 2015	NE	H (14)	NL	1	3
Order Testudines					
Emydidae					
Terrapene nelsoni Stejneger, 1925	DD	H (18)	Pr	1	3
Trachemys scripta (Thunberg, 1792)				IN	
Trachemys venusta (Gray, 1855)	NE	M (13)	NL	3	6
Geoemydidae					
Rhinoclemmys pulcherrima (Gray, 1855)	NE	L (8)	A	3	5
Rhinoclemmys rubida (Cope, 1870)	NT (↓)	H (14)	Pr	1	6
Kinosternidae					
Kinosternon herrerai Stejneger, 1925	NT (↓)	H (14)	Pr	1	4
Kinosternon hirtipes (Wagler, 1830)	LC (↓)	M (10)	Pr	2	6
Kinosternon integrum LeConte, 1854	LC (=)	M (11)	Pr	1	9
Kinosternon scorpioides (Linnaeus, 1766)	NE	M (10)	Pr	3	9
Trionychidae					
Apalone spinifera (Le Sueur, 1827)				IN	

Fifty of the 427 native species (34 amphibians and 16 reptiles) are endemic to the TVB province (Table 1). Eighty-four species, 69 amphibians and 15 reptiles, are IUCN listed (i.e., Vulnerable, Endangered, or Critically Endangered), 60 (18 amphibians and 42 reptiles) are placed in a protected category by Secretaría del Medio Ambiente y Recursos Naturales of Mexico (SEMARNAT), and 173 (69 amphibians and 104 reptiles) are categorized as high risk by the Environmental Vulnerability Score (EVS). Sixty-one of the 84 species listed with a protected category by IUCN are categorized as high risk by the EVS, and only 20 of them are listed with a threated category by SEMARNAT. Most of the species listed in a category of conservation concern status by IUCN are facing the destruction of their habitat due to urbanization and the transformation to agricultural land, especially those species found in cloud forest. Pollution of streams is another threat, mainly for amphibians.

In addition, seven species have been introduced to the TVB: *Eleutherodactylus planirostris* from the West Indies, *Rana catesbeiana* from northeastern Mexico, *Gehyra mutilata* from southeast Asia, *Hemidactylus mabouia* from sub-Saharan Africa, Nossi Be, Madagascar, and the Seychelles Archipelago, *Indotyphlops braminus* from India and parts of Asia, *Trachemys scripta* from northeastern Mexico, and *Apalone spinifera* from northern Mexico.

General distribution

Of the 154 species of amphibians, 121 are endemic to Mexico, and 34 of these are endemic to the TVB (nine anurans and 25 salamanders). Most of the 34 amphibians endemic to the TVB are limited to one or two states of this province, only three of these 34 species live in three states and one lives in four states. Most of the species endemic to the TVB have a limited distribution. For example, *Ambystoma altamirani* inhabits the Sierra de las Cruces that runs on a thin strip from the northwestern state of Mexico southward through the western edge of Mexico City to the northwestern edge of Morelos (Woolrich-Piña et al. 2017b); and *Ambystoma rivulare* is found from the western end of Michoacán, southward through the middle part of the state of Mexico to the northern tip of Guerrero (Woolrich-Piña et al. 2017b). The nine anurans endemic to the TVB have a very restricted distribution either to the central part of the TVB in the states of Morelos, Mexico, and Mexico City, or to the western part of this province in the states of Guerrero, Jalisco, or Michoacán (Lemos-Espinal and Smith 2020a,b,c). The reduced dispersal capacity of salamanders, which are especially diverse in the TVB, makes them susceptible to being endemic to this region. Twelve of the 17 Mexican species of the genus *Ambystoma* are endemic to the TVB. These salamanders are mostly present in the central and western part of the TVB, in the states of Morelos, Mexico, Mexico City, and Michoacán, the exception being *Ambystoma taylori* which is limited to the Crater Lakes of the state of Puebla (IUCN 2022; AmphibiaWeb 2024). Likewise, the four species of *Pseudoeurycea* endemic to the TVB are restricted to the central part of this province. The other nine plethodontid salamanders of the genera *Chiropterotriton*, *Isthmura*, and *Thorius*, are restricted to the east of the TVB mainly in the state of Veracruz, but also parts of Puebla and Hidalgo (Table 2).

Twenty-six of the remaining 87 species that are endemic to Mexico and that inhabit the TVB have a distribution that is limited to only two biogeographic provinces, the TVB and another. Twenty-two of these 26 are shared between the TVB and the Sierra Madre Oriental and are restricted to eastern Mexico.

Table 2. Amphibian species endemic to the TVB. States recorded refers to the state of the TVB in which the species has been recorded. Total refers to the total number of states of the TVB in which the species has been recorded. State abbreviations are: Jal (Jalisco); Mich (Michoacán); Gro (Guerrero); Mor (Morelos); Mx (State of Mexico); MxC (Mexico City); Ver (Veracruz); Hgo (Hidalgo); Pue (Puebla).

State Recorded	Jal	Mich	Gro	Mor	Mx	MxC	Ver	Hgo	Pue	Total
Class Amphibia										
Order Anura										
Craugastoridae										
Craugastor cueyatl				1		1				**2**
Eleutherodactylidae										
Eleutherodactylus erendirae	1	1								**2**
Eleutherodactylus floresvillelai		1								**1**
Eleutherodactylus franzi			1							**1**
Eleutherodactylus grandis						1				**1**
Eleutherodactylus humboldti					1					**1**
Ranidae										
Rana chichicuahutla									1	**1**
Rana dunni		1								**1**
Rana tlaloci					1	1				**2**
Order Caudata										
Ambystomatidae										
Ambystoma altamirani				1	1	1				**3**
Ambystoma amblycephalum		1								**1**
Ambystoma andersoni		1								**1**
Ambystoma bombypellum					1					**1**
Ambystoma dumerilii		1								**1**
Ambystoma granulosum					1					**1**
Ambystoma leorae					1				1	**2**
Ambystoma lermaense					1					**1**
Ambystoma mexicanum						1				**1**
Ambystoma ordinarium		1			1					**2**
Ambystoma rivulare		1	1		1					**3**
Ambystoma taylori									1	**1**
Plethodontidae										
Chiropterotriton casasi							1			**1**
Chiropterotriton ceronorum							1			**1**
Chiropterotriton chico								1		**1**
Chiropterotriton lavae							1			**1**
Chiropterotriton nubilus							1			**1**
Chiropterotriton perotensis							1			**1**
Chiropterotriton totonacus							1			**1**
Isthmura corrugata							1			**1**
Pseudoeurycea altamontana				1	1	1		1		**4**
Pseudoeurycea longicauda		1			1					**2**
Pseudoeurycea robertsi					1					**1**
Pseudoeurycea tlilicxitl				1	1	1				**3**
Thorius spilogaster							1			**1**

Three other species are found in the TVB and parts of western Mexico. The other 19 amphibians that inhabit only two provinces are salamanders of the plethodontidae family, 18 of them are shared between the TVB and the Sierra Madre Oriental, and one is shared with the Chihuahuan Desert. Another 22 species are shared between the TVB and two other provinces, 18 of these 22 with the Sierra Madre Oriental and another province, all of them restricted to eastern Mexico. Eight of these 18 are shared with the eastern end of the Chihuahuan Desert. Seven are shared with the Veracruzan. Four are shared with the Sierra Madre del Sur. Four species that are shared between three provinces, including the TVB, are species from western Mexico, two of them are shared between the TVB, Sierra Madre Occidental and Pacific Lowlands, and two between the TVB, Sierra Madre del Sur and Pacific Lowlands or Balsas Basin. The other 39 species endemic to Mexico that inhabit the TVB are distributed between four and eight biogeographic provinces. 12 are in four provinces, 14 in five provinces, nine in six provinces, three in seven provinces, and one in eight provinces.

The 33 native species of amphibians that are not endemic to Mexico have a wide distribution. Nine are shared with the US, 20 are found from Mexico to Central or South America, and four are distributed from extreme southeastern US to Central or South America.

Like amphibians, the native species of reptiles that inhabit the TVB are mostly endemic to Mexico; however, their dispersal ability and their ability to occupy arid habitats means that individual reptile species are found in more biogeographic provinces and are distributed further north and south within Mexico (Pianka and Vitt 2003; Buckley and Jetz 2007; Titon and Gomes 2015). One hundred and seventy-three (63.1%) of the 273 species of reptiles found in the TVB are endemic to Mexico of which 16 are endemic to the TVB (Table 1). The other 157 species of reptiles endemic to Mexico are shared between the TVB and at least one of the other thirteen biogeographic provinces, except with California. The largest number of species are shared with the Sierra Madre del Sur (103), followed by the Sierra Madre Oriental (84), the Balsas Basin (72), the Chihuahuan Desert (66), the Sierra Madre Occidental (60), the Pacific Lowlands (60), and the Veracruzan (42). The rest of the provinces share relatively few species with the TVB: Chiapas Highlands (14), Sonoran Desert (5), Tamaulipas (4), Baja California and Yucatan Peninsula (1). Furthermore, 22 of these 157 species are found only in the TVB and another biogeographic province; 34 occupy three provinces including the TVB; 43 inhabit four provinces; 25 inhabit five provinces; 14 are distributed in six provinces; 11 in seven provinces; five in eight provinces; and three in nine provinces.

Of the 100 species of reptiles in the TVB that are not endemic to Mexico, 27 are shared with the US, 62 are distributed from Mexico to Central or South America, and 11 range from the US to Central or South America. These numbers and distributions show that the TVB is home to a diversity of reptile species that are a mix of species from southern and northern, as well as eastern and western Mexico (Table 1).

Comparison with neighboring provinces

The TVB shares >50% of its amphibian and reptile species with the Sierra Madre Oriental 58.8% (253 shared species) and the Sierra Madre del Sur 54.1% (231) (Table 3). For amphibians, the TVB shares 60.6% of its species with the Sierra

Madre Oriental: 65.6% anurans and 54.4% salamanders. The TVB shares 39.4% of its amphibian species: 61.1% of anurans, 3.5% of salamanders, and 50% of Gymnophiona with the Sierra Madre del Sur. The TVB also shares a relatively high percentage of its amphibian species with the Veracruzan province: 47.4% of anurans, 10.5% of salamanders, and 50% of caecilians. The percentages of amphibian species shared with the other four neighboring provinces are much lower: Pacific Lowlands 27.1%; Balsas Basin 26.5%; Chihuahuan Desert 24.5%; and Sierra Madre Occidental 23.2%. These results show that most of the amphibian species of the TVB are characteristic of the humid tropics of eastern Mexico. This is most noticeable in the Hylidae and Plethodontidae. The TVB shares 76.7% (23/30) of its hylid species with the Sierra Madre Oriental and 73.3% (22/30) with the Sierra Madre del Sur, and shares 68.2% (30/44) of its plethodontid species with the Sierra Madre Oriental. Thirteen of the 14 species of plethodontids that are not shared between the TVB and the Sierra Madre Oriental are endemic to the TVB. Likewise, the ambystomatid salamanders of the TVB are practically exclusive to the TVB, 12 of its 13 species are endemic to the TVB, most of them with a distribution in the western half of the TVB. However, the TVB is also home to a large number of amphibian species characteristic of the western half, such as those of the genus *Ambystoma*.

The number of reptile species shared between the TVB and its neighboring provinces was highest with the Sierra Madre del Sur (62.3% = 170 /273) followed by the Sierra Madre Oriental (58.2% = 159/273). For the Phrynosomatidae, the most diverse family of lizards in the TVB, 27 of 42 species (64.3%) are shared with the Sierra Madre del Sur, and 18 of 42 species (42.9%) are shared with the Sierra Madre Oriental. For the two most diverse families of snakes, Colubridae and Dipsadidae, the majority of species are shared with the Sierra Madre del Sur (Colubridae: 36 of 49 species, 73.4%; Dipsadidae: 32 of 52 species, 61.5%), and the Sierra Madre Oriental (Colubridae: 29 of 49 species, 59.2%; Dipsadidae: 32 of 52 species, 61.5%). The percentages and numbers of species shared with the other five neighboring provinces are lower: Veracruzan 44.3% (121/273); Pacific Lowlands 43.6% (119/273); Balsas Basin 40.3% (110/273); Chihuahuan Desert 37.7% (103/273); and Sierra Madre Occidental 34.4% (94/273) (Table 3). Although these numbers show a slight tendency for reptile species characteristic of eastern Mexico to inhabit the TVB due to the number of species shared between the TVB and the Sierra Madre Oriental, they also show that the TVB is home to a mixture of reptile species from both the east and west (e.g., the percentages of shared species with the Veracruzan [44.3%] and Pacific Lowlands [43.6%] are similar), and the south and north (e.g., the percentages of species shared with the Balsas Basin [40.3%] and the Chihuahuan Desert [37.7%] are similar). Likewise, the number of reptile species endemic to the TVB is relatively low 16 of 273 species (5.9%), suggesting the TVB does not house a particularly unique assortment of reptile species. Total surface area, the length of the shared border with the TVB, and the distance between geographic centroids of each of the neighboring provinces of the TVB do not seem to influence the number of species shared between the TVB and its neighboring provinces (Table 4; see below). However, the total number of amphibian and reptile species in each neighboring province significantly influences the number of species shared between the TVB and its neighboring provinces (Table 4; see below).

Table 3. Summary of the number of species shared between the TVB and neighboring biogeographic provinces (not including introduced species). The percent of the TVB shared by neighboring provinces are given in parentheses. Total refers to the number of species found in the TVB and seven neighboring provinces (i.e., regional species pool) and the number in parentheses in this column is the percent of the regional species pool found in the TVB. – indicates either the TVB or their neighboring province has no species in the taxonomic group, or none of that specific taxon is shared between the provinces, thus no value for shared species is provided. Abbreviations of the Biogeographic Provinces are: TVB (Transvolcanic Belt); SMOri (Sierra Madre Oriental); SMS (Sierra Madre del Sur); Ver (Veracruzan); Pacific (Pacific Lowlands); Balsas (Balsas Basin); CD (Chihuahuan Desert), and SMOcc (Sierra Madre Occidental). Even though the Sierra Madre Occidental does not contact the TVB (according to the map and shape file in Morrone et al. 2017), we included it as a neighboring province for the TVB.

	TVB	SMOri	SMS	Ver	Pacific	Balsas	CD	SMOcc	Total
Amphibia	**155**	**94 (60.6)**	**61 (39.4)**	**52 (33.5)**	**42 (27.1)**	**41 (26.5)**	**38 (24.5)**	**36 (23.2)**	**371 (41.8)**
Anura	**95**	**63 (65.6)**	**58 (61.1)**	**45 (47.4)**	**40 (42.1)**	**40 (41.7)**	**30 (31.6)**	**34 (35.8)**	**230 (41.3)**
Bufonidae	9	8 (88.9)	4 (44.4)	6 (66.7)	6 (66.7)	5 (55.6)	5 (55.6)	6 (66.7)	28 (32.1)
Centrolenidae	1	1 (100)	1 (100)	1 (100)	1 (100)	–	–	–	1 (100)
Craugastoridae	13	9 (69.2)	9 (69.2)	8 (61.5)	6 (46.2)	6 (46.2)	2 (15.4)	4 (30.8)	35 (37.1)
Eleutherodactylidae	19	8 (42.1)	7 (0.37)	5 (26.3)	5 (26.3)	2 (10.5)	2 (10.5)	3 (15.8)	41 (46.3)
Hylidae	30	23 (76.7)	22 (73.3)	14 (46.7)	9 (30)	12 (40)	10 (33.3)	7 (23.3)	82 (36.6)
Leptodactylidae	2	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	3 (66.7)
Microhylidae	2	2 (100)	2 (100)	2 (100)	2 (100)	2 (100)	1 (50)	2 (100)	5 (40)
Phyllomedusidae	2	1 (50)	2 (100)	1 (50)	2 (100)	1 (50)	–	1 (33.3)	3 (67)
Ranidae	15	6 (40)	8 (53.3)	4 (26.7)	6 (40)	9 (60)	6 (40)	8 (53.3)	28 (53.6)
Rhinophrynidae	–	–	–	–	–	–	–	–	1 (0)
Scaphiopodidae	2	2 (100)	1 (50)	2 (100)	1 (50)	1 (50)	2 (100)	2 (100)	3 (66.7)
Caudata	**57**	**31 (54.4)**	**2 (3.5)**	**6 (10.5)**	**–**	**1 (1.8)**	**8 (14)**	**2 (3.5)**	**138 (41.3)**
Ambystomatidae	13	1 (7.7)	1 (7.7)	–	–	1 (7.7)	1 (7.7)	1 (7.7)	17 (76.5)
Plethodontidae	44	30 (68.2)	1 (2.3)	6 (13.6)	–		7 (15.9)	1 (2.3)	119 (37)
Salamandridae	–	–	–	–	–	–	–	–	1 (0)
Sirenidae	–	–	–	–	–	–	–	–	1 (0)
Gymnophiona	**2**	**–**	**1 (50)**	**1 (50)**	**2 (100)**	**–**	**–**	**–**	**3 (66.7)**
Dermophiidae	2	–	1 (50)	1 (50)	2 (100)	–	–	–	3 (66.7)
Reptilia	**273**	**159 (58.2)**	**170 (62.3)**	**121 (44.3)**	**119 (43.6)**	**110 (40.3)**	**103 (37.7)**	**94 (34.4)**	**749 (36.4)**
Crocodylia	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**–**	**3 (33.3)**
Alligatoridae	–	–	–	–	–	–	–	–	1 (0)
Crocodylidae	–	–	–	–	–	–	–	–	2 (50)
Squamata	**265**	**154 (57.9)**	**166 (62.6)**	**116 (43.8)**	**113 (42.6)**	**106 (40)**	**101 (38.1)**	**90 (34)**	**699 (37.9)**
Lacertilia	**105**	**58 (54.7)**	**66 (62.9)**	**40 (38.1)**	**39 (37.1)**	**40 (38.1)**	**35 (33.3)**	**32 (30.5)**	**348 (30.2)**
Anguidae	12	8 (66.7)	4 (33.3)	4 (33.3)	2 (16.7)	2 (16.7)	6 (50)	3 (25)	34 (35.3)
Anolidae	9	8 (88.9)	6 (66.7)	5 (55.6)	1 (11.1)	2 (22.2)	1 (11.1)	1 (11.1)	47 (19.1)
Bipedidae	–	–	–	–	–	–	–	–	2 (0)
Corytophanidae	3	2 (66.7)	2 (66.7)	3 (100)	2 (66.7)	1 (33.3)	–	–	5 (60)
Crotaphytidae	–	–	–	–	–	–	–	–	4 (0)
Dibamidae	1	1 (100)	–	1 (100)	–	–	1 (100)	–	1 (100)
Diploglossidae	2	2 (100)	1 (50)	1 (50)	–	–	–	–	4 (50)
Eublepharidae	1	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)	–	–	5 (20)
Gymnophthalmidae	–	–	–	–	–	–	–	–	1 (0)
Helodermatidae	1		1 (100)		1 (100)	1 (100)	–	1 (100)	4 (25)

	TVB	SMOri	SMS	Ver	Pacific	Balsas	CD	SMOcc	Total
Iguanidae	3	2 (66.7)	3 (100)	2 (66.7)	2 (66.7)	3 (100)	1 (33.3)	1 (33.3)	9 (33.3)
Phrynosomatidae	42	18 (42.9)	27 (64.3)	6 (14.3)	12 (28.6)	17 (40.5)	18 (42.9)	18 (42.9)	113 (37.2)
Phyllodactylidae	3	–	3 (100)	–	2 (66.7)	2 (66.7)		1 (33.3)	15 (20)
Scincidae	14	7 (50)	9 (64.3)	8 (57.1)	8 (57.1)	5 (35.7)	4 (28.6)	3 (21.4)	32 (43.8)
Sphaerodactylidae	1	1 (100)	1 (100)	1 (100)	1 (100)	–	–	–	3 (33.3)
Teiidae	8	4 (50)	7 (87.5)	4 (50)	6 (75)	6 (75)	3 (37.5)	3 (37.5)	34 (23.5)
Xantusidae	4	3 (75)	–	3 (75)	–	–	1 (25)	1 (25)	22 (18.2)
Xenosauridae	1	1 (100)	1 (100)	1 (100)	1 (100)	–	–	–	13 (7.7)
Serpentes	**160**	**96 (60)**	**100 (62.5)**	**76 (47.5)**	**74 (46.3)**	**66 (41.3)**	**66 (41.3)**	**58 (36.3)**	**351 (45.6)**
Boidae	2	1 (50)	2 (100)	1 (50)	2 (100)	2 (100)		1 (50)	4 (50)
Colubridae	49	29 (59.2)	36 (73.4)	28 (57.1)	30 (61.2)	29 (59.2)	22 (44.9)	25 (51)	115 (42.6)
Dipsadidae	52	32 (62.7)	32 (61.5)	26 (50)	24 (46.2)	15 (28.8)	19 (36.5)	12 (23.1)	119 (43.7)
Elapidae	8	4 (44.4)	6 (75)	4 (50)	5 (62.5)	2 (25)	3 (37.5)	3 (37.5)	16 (50)
Leptotyphlopidae	5	2 (40)	3 (60)	1 (20)	2 (40)	4 (80)	2 (40)	1 (20)	13 (38.5)
Loxocemidae	1	–	1 (100)	1 (100)	1 (100)	1 (100)	–	–	1 (100)
Natricidae	17	14 (82.4)	7 (41.2)	7 (41.2)	4 (23.5)	5 (29.4)	12 (70.6)	8 (47.1)	31 (54.8)
Typhlopidae	1	1 (100)	–	1 (100)	–	–	–	–	1 (100)
Viperidae	25	13 (52)	13 (52)	7 (28)	6 (24)	8 (32)	8 (32)	8 (32)	51 (41)
Testudines	**8**	**5 (62.5)**	**4 (50)**	**5 (62.5)**	**6 (75)**	**4 (50)**	**2 (25)**	**4 (50)**	**47 (17)**
Cheloniidae	–	–	–	–	–	–	–	–	5 (0)
Chelydridae	–	–	–	–	–	–	–	–	1 (0)
Dermatemydidae	–	–	–	–	–	–	–	–	1 (0)
Dermochelyidae	–	–	–	–	–	–	–	–	1 (0)
Emydidae	2	1 (50)	–	1 (50)	1 (50)	–	–	1 (50)	15 (13.3)
Geoemydidae	2		2 (100)	1 (50)	2 (100)	1 (50)	–	1 (50)	3 (66.7)
Kinosternidae	4	4 (100)	2 (50)	3 (75)	3 (75)	3 (75)	2 (50)	2 (50)	17 (11.8)
Testudinidae	–	–	–	–	–	–	–	–	3 (0)
Trionychidae	–	–	–	–	–	–	–	–	1 (0)
Total	**427**	**253 (58.8)**	**231 (54.1)**	**173 (40.5)**	**161 (37.7)**	**151 (35.4)**	**141 (33)**	**130 (30.4)**	**1120 (38.1)**

Table 4. Surface area in km^2 of the TVB and each of its seven neighboring biogeographic provinces, Sierra Madre Occidental included even though it does not contact the TVB; contact area in km between the TVB and each of its seven neighboring biogeographic provinces; distances between the centroid in km between the TVB and each of its seven neighboring biogeographic provinces (does not apply for Sierra Madre Occidental); Shared Species between the TVB and each of its seven neighboring biogeographic provinces in number of species, number in parentheses represents the percentage of the number of shared species between the neighboring province and the TVB; and Number of Species of each of the neighboring provinces.

Neighboring Provinces	Surface Area (km^2)	Surface Contact Area (km)	Distance between centroids (km)	Shared Species	Number of Species
Transvolcanic Belt	82,840.00	–	–	–	427
Sierra Madre del Sur	93,606.90	434	227.7	231	517
Sierra Madre Oriental	51,897.30	307	314.4	253	382
Veracruzan	191,451.10	281	465.1	173	340
Pacific Lowlands	187,112.90	1272	526.3	161	325
Chihuahuan Desert	578,001.50	1488	781.9	141	262
Sierra Madre Occidental	171,195.10	NA	890.2	130	217
Balsas Basin	76,135.80	1968	172.7	151	206

This is a reaffirmation of the fact that the TVB is a transition province inhabited by species from a variety of neighboring provinces. Furthermore, the topographical, climatic, and vegetation characteristics of the TVB mean that this province has the necessary conditions to host species of amphibians and reptiles with both Neotropical and Nearctic affinities.

Similarities

The Jaccard distances between pairs of provinces for amphibians and reptiles were highly positively correlated (Fig. 4; n = 28, Spearman's $\rho = 0.7446$, $p < 0.0001$). Jaccard distances between pairs of provinces for amphibians were positively correlated with the length of the shared border (Fig. 5A; n = 28, Spearman's $\rho = 0.5342$, $p < 0.005$) and negatively correlated with the distance between their geographic centroids (Fig. 5C; n = 28, Spearman's $\rho = -0.3957$, $p < 0.05$). Similarly, r Jaccard distances between pairs of provinces for reptiles were positively correlated with the length of the shared border (Fig. 5B; n = 28, Spearman's $\rho = 0.6531$, $p < 0.0005$) and negatively correlated with the distance between their geographic centroids (Fig. 5D; n = 28, Spearman's $\rho = -0.7002$, $p < 0.0001$). Taken together, our results suggest that many of the similarities and differences in the herpetofauna among Mexican biogeographic provinces are a consequence of their proximity.

On the other hand, the numbers of amphibian and reptile species in a province were not correlated with its surface area (amphibians: n = 8, Spearman's $\rho = -0.26$, $p = 0.53$); reptiles: n = 8, Spearman's $\rho = -0.20$, $p = 0.63$) or the longitude of its geographic centroid (amphibians: n = 8, Spearman's $\rho = 0.26$, $p = 0.53$; reptiles: n = 8, Spearman's $\rho = 0.24$, $p = 0.57$). Likewise, the numbers of amphibian and reptile species in a province were not correlated with the latitude of its geographic centroid (amphibians: n = 8, Spearman's $\rho = -0.36$, $p = 0.38$; reptiles: n = 8, Spearman's $\rho = -0.28$, $p = 0.51$).

The cluster analysis for amphibians revealed two well-differentiated clusters (Fig. 6A). The first is formed by the TVB, the Sierra Madre Oriental, and the Veracruzan, and the second is comprised of the Sierra Madre Occidental, the Balsas Basin, the Pacific Lowlands, and the Chihuahuan Desert. The Sierra Madre del Sur then joins these two clusters. The first cluster exhibits a close relationship with the proximity of the TVB to the Sierra Madre Oriental (314 km) and Veracruzan (465 km), two of the closest provinces to the TVB. Additionally, there is a high percentage of amphibian species shared with these two neighboring provinces (Sierra Madre Oriental (60.6%), and the Veracruzan (34.2%)) (Table 3). The region in which these three provinces are closest to each other is a region in which a high number of endemic hylid and plethodontid species is found, some of which are shared between the three provinces. These factors likely contribute to the formation of Cluster AI. Cluster AII is composed of provinces with a predominance of amphibian species from western Mexico: Chihuahuan Desert (53), Sierra Madre Occidental (57), and Balsas Basin (51). Although the Sierra Madre del Sur shares a relatively high percentage of amphibian species with the TVB (39.4%) and is the closest province to the TVB (228 km), it is isolated from these two clusters. This is due to the high species richness of amphibians in the Sierra Madre del Sur (186) and the high percentage of species endemic to it (52.7%). In addition, the Sierra Madre del Sur itself does not appear to be a sin-

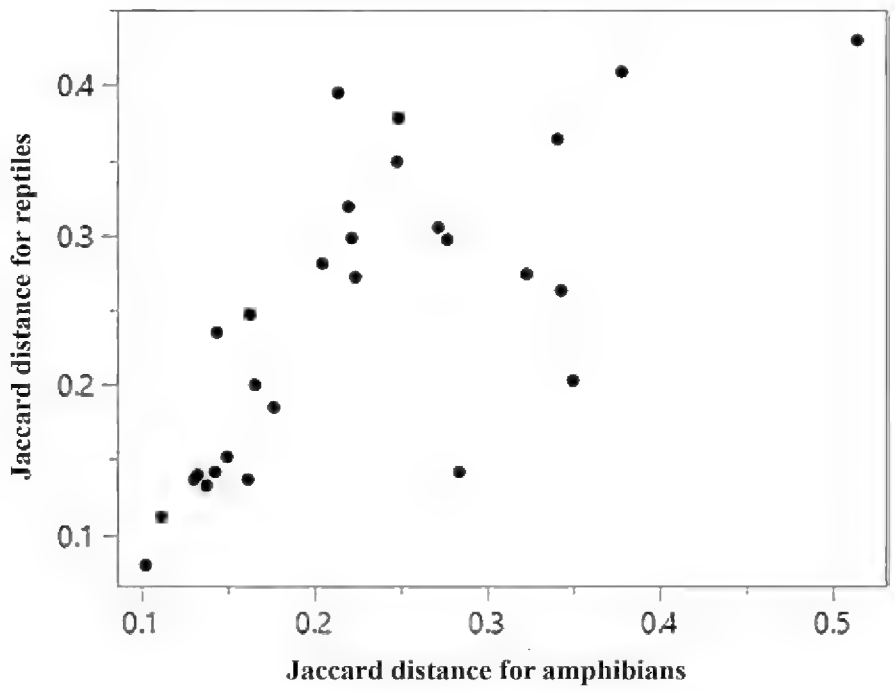

Figure 4. The correlation between the Jaccard distance of amphibians and reptiles among the TVB and its neighboring biogeographic provinces of Mexico.

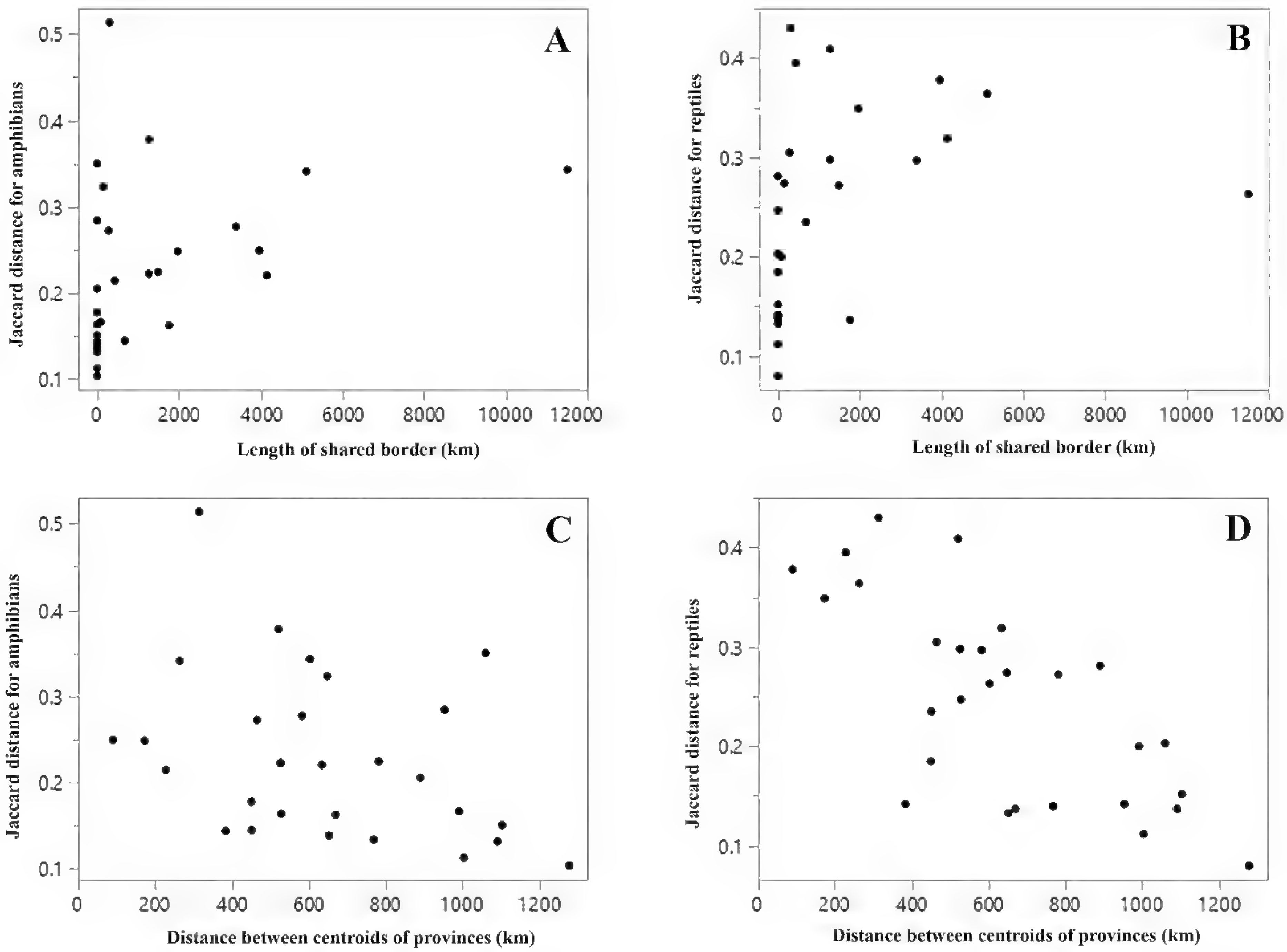

Figure 5. The relationships between Jaccard distances for length of shared border and distance between centroids of the TVB and its neighboring biogeographic provinces and the Jaccard distances of amphibians (**A, C** respectively) and reptiles (**B, D** respectively).

gle, homogeneous biogeographic province with respect to its herpetofauna and other taxa (Luna-Vega et al. 1999; Santiago-Alvarado et al. 2016). This gives the Sierra Madre del Sur a unique identity, different from the other provinces, even though it shares a significant number of species with them.

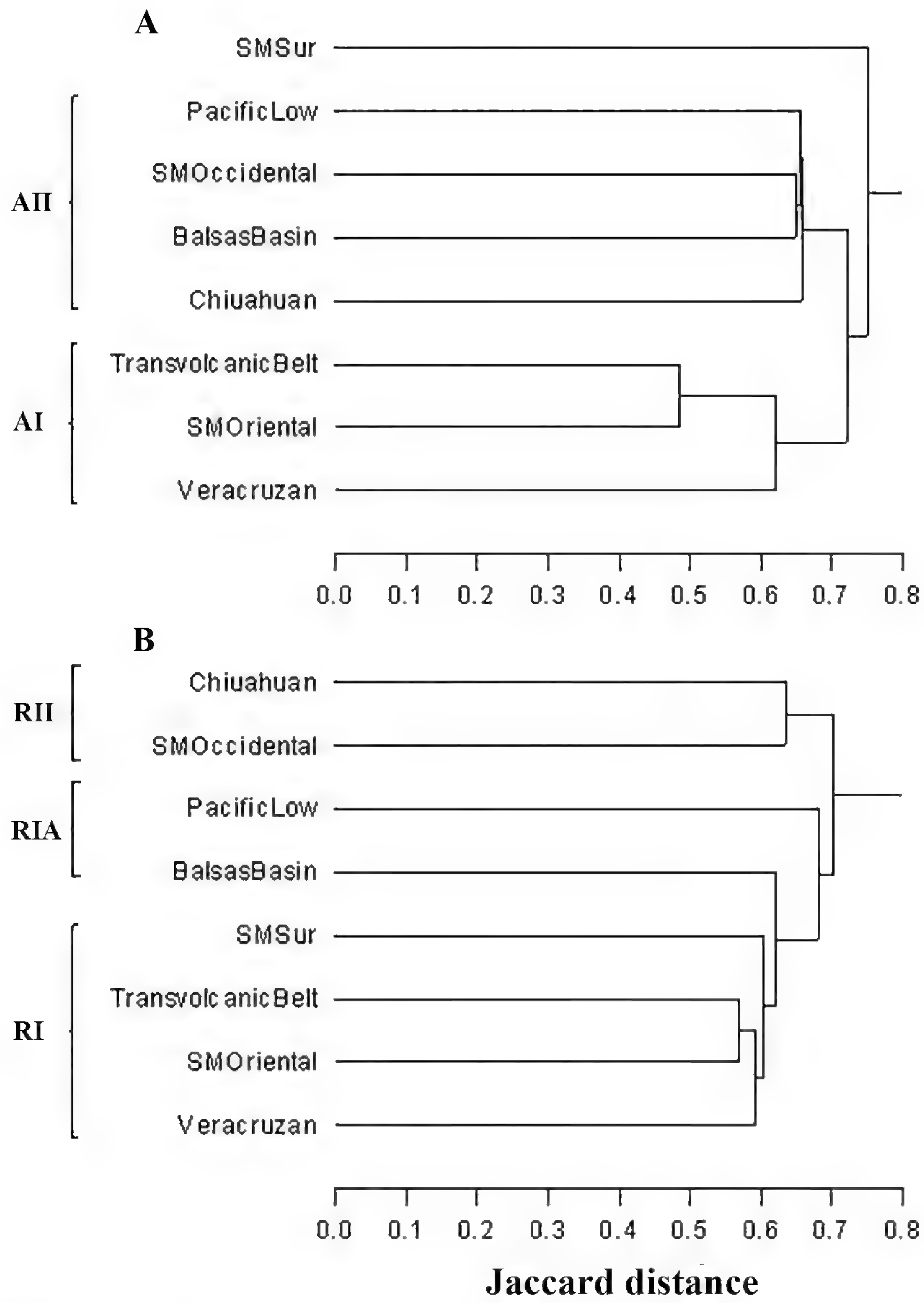

Figure 6. Cluster trees for amphibians **A** of the TVB and its neighboring biogeographic provinces and **B** Cluster trees for reptiles of TVB and its neighboring biogeographic provinces. Clusters are identified with Roman numerals.

The cluster analysis for reptiles is somewhat similar to that for amphibians (Fig. 6B). As with the amphibians, there are two well-differentiated clusters for the reptiles, the first formed by four provinces with marked geographical proximity; the TVB, the Sierra Madre Oriental, and the Veracruzan as in amphibians, but the Sierra Madre del Sur also joins this cluster. This may result from the greater mobility that reptiles show compared to amphibians, being independent of water for their reproduction and tolerating drought conditions. Unlike in the amphibians, the Balsas Basin and Pacific Lowlands connect with the Sierra Madre del Sur to form the subcluster RIA. The RII cluster is formed by the Sierra Madre Occidental and the Chihuahuan Desert which are very closely related geographically with a short distance between their geographic centroids (263 km) and an extensive shard border (5,120 km).

Conservation status

Eighty-four (21.9% = 84/384) of the 427 native species of amphibians and reptiles that inhabit the TVB are included in a category of conservation concern in the IUCN Red List (i.e., Vulnerable, Endangered, or Critically Endangered), 60 (14.1% = 60/427) are placed in some category of protection by SEMARNAT (excluding not listed [NL] and subject to special protection [Pr], this last category is equivalent to the least concern [LC] category of IUCN), and 173 (43.1% = 173/401) are considered high risk by the EVS (Fig. 7, Table 5). Sixty-nine amphibians (46.9%) are included in the IUCN Red List, 16 of them listed as Vulnerable, 26 as Endangered, and 27 as Critically Endangered, most of them have a decreasing population trend, and all of them endemic to Mexico, and 31 are endemic to the TVB (IUCN 2022). Three of the four species endemic to the TVB that are not included in the IUCN Red List with a protected status were recently described: *Craugastor cueyatl* Jameson et al. 2022; *Eleutherodactylus franzi* Grünwald et al. 2023, and *Eleutherodactylus humboldti* Devitt et al. 2023. Another is considered as Data Deficient (DD): *Ambystoma bombypellum*. All of these species are facing increasing rates of habitat loss due to urbanization and transformation for agricultural use (IUCN 2022). Some are also threatened by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis*, and others face the presence of predators and competitors that have been introduced to their habitat, such as bullfrogs, rainbow trout, sport fish, and crayfish (IUCN 2022). Eighteen amphibian species (11.6% = 18/155) are protected by SEMARNAT; and 69 species are considered of high risk by EVS (50.0% = 69/138) (Table 5).

For reptiles, 6.3% (15/237) are included in some category of conservation concern in the IUCN Red List, 15.4% (42/273) are listed by SEMARNAT, and 39.5% (104/263) are considered to be at high risk by EVS (Fig. 7). Six of the 15 species included in the IUCN Red List are Endangered (EN) and nine are Vulnerable (VU) (Table 5). All of the listed species are endemic to Mexico, and three are endemic to the TVB. All these species are threatened by habitat loss which is exacerbated by limited distributions. For example, lizards in the genera *Abronia* and *Barisia* have highly restricted distributions and are threatened by increasing habitat loss (IUCN 2022). In addition, species in the genus *Abronia* are targeted by the illegal pet trade, significantly impacting their populations (IUCN 2022). The convergence of these factors poses a significant threat to the survival of these species. Other species such as *T. melanogaster*, although it has a relatively wide distribution in north-central Mexico, is rapidly losing its habitat due to the contamination of the streams it occupies by pollution from agricultural and industrial waste (IUCN 2022). Eleven of the 15 species listed by the IUCN are categorized as high risk by the EVS, but only six are listed with a threatened category by SEMARNAT (Table 5).

As mentioned above, the main threat to the amphibians and reptiles of the TVB is the loss of their habitats, which are being rapidly urbanized, transformed into agricultural fields, cleared, or polluted (IUCN 2022). In addition, this habitat loss is enhanced by the acid rain that occurs throughout and near the large cities found in the TVB (IUCN 2022). These threats, along with other threats including emerging diseases, such as *B. dendrobatidis*, the introduction of non-native species, and climate change demand rapid conservation and management actions to prevent the decline and ultimately the disappearance of the amphibians and reptiles of the TVB.

Table 5. Summary of native species present in TVB biogeographic province of Mexico by family, order or suborder, and class. Status summary indicates the number of species found in each IUCN conservation status in the order DD, LC, VU, NT, EN, CR (see Table 1 for abbreviations; in some cases, species have not been assigned a status by the IUCN and therefore these may not add up to the total number of species in a taxon). Mean EVS is the mean Environmental Vulnerability Score; scores ≥ 14 are considered high vulnerability (Wilson et al. 2013a, b) and conservation status in Mexico according to SEMARNAT (2019) in the order NL, Pr, A, P (see Table 1 for abbreviations).

Scientific Name	Genera	Species	IUCN	x̄ EVS	SEMARNAT
			DD, LC, NT, VU, EN, CR		NL, Pr, A, P
Class Amphibia					
Order Anura	**26**	**95**	**1,64,3,10,7,4**	**11.3**	**65,21,7,2**
Bufonidae	3	9	0,7,0,0,1,0	9.1	8,1,0,0
Centrolenidae	1	1	0,0,0,0,0,0	10	1,0,0,0
Craugastoridae	1	13	0,12,0,0,1,0	12.8	11,2,0,0
Eleutherodactylidae	1	19	1,9,0,4,2,0	15.3	12,7,0,0
Hylidae	14	30	0,18,2,5,2,2	10.5	20,4,6,0
Leptodactylidae	1	2	0,2,0,0,0,0	5.5	2,0,0,0
Microhylidae	1	2	0,2,0,0,0,0	5.5	1,1,0,0
Phyllomedusidae	1	2	0,2,0,0,0,0	11.7	2,0,0,0
Ranidae	1	15	0,10,1,1,1,2	11.7	6,6,1,2,
Scaphiopodidae	2	2	0,2,0,0,0,0	4.5	2,0,0,0
Order Caudata	**8**	**57**	**1,7,0,6,19,23**	**15.5**	**18,30,8,1**
Ambystomatidae	1	13	1,1,0,0,5,6	13.9	0,9,3,1
Plethodontidae	7	44	0,6,0,6,14,17	16	18,21,5,0
Order Gymnophiona	**1**	**2**	**0,2,0,0,0,0**	**11.5**	**0,2,0,0**
Dermophiidae	1	2	0,2,0,0,0,0	11.5	0,2,0,0
Subtotal	**35**	**154**	**2,73,3,16,26,27**	**12.8**	**83,53,15,3**
Class Reptilia					
Order Squamata	**84**	**265**	**27,187,3,9,6,0**	**12.1**	**151,73,37,4**
Suborder Lacertilia	**28**	**105**	**5,75,1,5,4,0**	**12.5**	**62,29,11,3**
Anguidae	5	12	0,5,0,1,4,0	13.5	3,5,2,2
Anolidae	1	9	1,6,1,0,0,0	11.6	7,1,1,0
Corytophanidae	3	3	0,3,0,0,0,0	9.7	2,1,0,0
Dibamidae	1	1	0,1,0,0,0,0	10	0,0,1,0
Diploglossidae	1	2	0,2,0,0,0,0	14	1,1,0,0
Eublepharidae	1	1	0,1,0,0,0,0	9	0,0,1,0
Helodermatidae	1	1	0,1,0,0,0,0	11	0,0,1,0
Iguanidae	2	3	0,3,0,0,0,0	13	0,2,1,0
Phrynosomatidae	3	42	1,33,0,1,0,0	12.8	34,6,2,0
Phyllodactylidae	1	3	0,3,0,0,0,0	13	1,1,1,0
Scincidae	3	14	2,8,0,1,0,0	12.4	8,5,1,0
Sphaerodactylidae	1	1	0,1,0,0,0,0	12	0,1,0,0
Teiidae	2	8	0,6,0,0,0,0	11.5	5,3,0,0
Xantusidae	2	4	1,2,0,1,0,0	14	1,2,0,1
Xenosauridae	1	1	0,0,0,1,0,0	9	0,1,0,0
Suborder Serpentes	**56**	**160**	**22,112,2,4,2,0**	**11.9**	**89,44,26,1**
Boidae	1	2	0,1,0,0,0,0	10	2,0,0,0
Colubridae	21	49	3,41,1,0,0,0	10.9	34,5,10,0
Dipsadidae	18	52	14,32,0,2,0,0	11.4	30,22,0,0
Elapidae	2	8	0,8,0,0,0,0	12.6	1,6,1,0
Leptotyphlopidae	2	5	1,3,0,0,0,0	11.4	4,1,0,0
Loxocemidae	1	1	0,1,0,0,0,0	10	0,1,0,0

Scientific Name	Genera	Species	IUCN	x̄ EVS	SEMARNAT
			DD, LC, NT, VU, EN, CR		NL, Pr, A, P
Natricidae	4	17	1,13,0,2,1,0	12.2	6,1,10,0
Typhlopidae	1	1	0,1,0,0,0,0	11	1,0,0,0
Viperidae	6	25	3,12,1,0,1,0	14.9	11,8,5,1
Order Testudines	**4**	**8**	**1,2,2,0,0,0**	**12.3**	**1,6,1,0**
Emydidae	2	2	1,0,0,0,0,0	15.5	1,1,0,0
Geoemydidae	1	2	0,0,1,0,0,0	11	0,1,1,0
Kinosternidae	1	4	0,2,1,0,0,0	11.3	0,4,0,0
Subtotal	**88**	**273**	**28,189,5,9,6,0**	**12.1**	**152,79,38,4**
Total	**123**	**427**	**30,262,8,25,32,27**	**12.4**	**235,132,53,7**

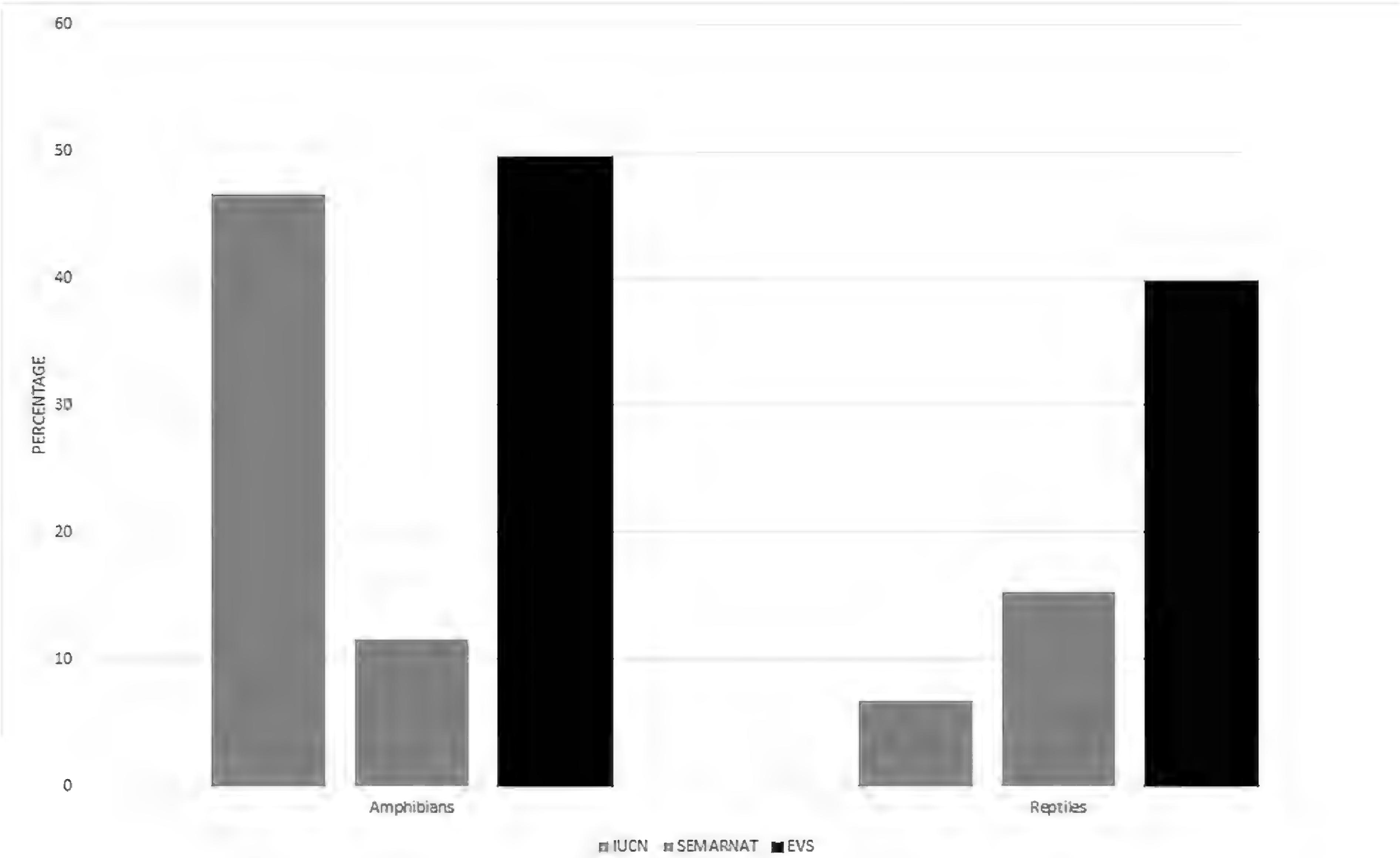

Figure 7. Percentage of amphibian and reptile species with conservation concern status (IUCN 2022), protected by the Mexican government (SEMARNAT 2019), or deemed to have a high environmental vulnerability score (EVS), for the TVB biogeographic provinces of Mexico.

The growth of the cities of Mexico, Cuernavaca and Toluca in the center of the TVB, is especially worrying. Species such as *Eleutherodactylus grandis*, *Rana tlaloci*, *Ambystoma altamirani*, *A. mexicanum*, *Pseudoeurycea tlilicxitl*, among others, are threatened by the excessive and accelerated growth of these cities, which seems to be occurring unplanned and unchecked (J. Lemos-Espinal personal observation). This problem is largely the result of the centralization of major governmental service to urban areas by the Mexican government that began in the early 20th century. Due to the resulting lack of opportunities in rural areas and the resulting widespread poverty, people abandon the unprofitable crop fields and migrated to cities that already are expanding due to high birth rates. Of particular concern is that species whose distributions are limited to Mexico City, such as *Rana tlaloci*, often lack recent records, and the distributions

of other species have been reduced to small areas within Mexico City, such as *Eleutherodactylus grandis*, which is currently limited to the Pedregal Reserve, or *Ambystoma mexicanum* which is limited to Lake Xochimilco (Contreras et al. 2009; IUCN 2022). Other species such as *Ambystoma altamirani* that inhabit streams in the Sierra de las Cruces, are seeing their habitat reduced due to the growth of these cities which are increasingly threatening to form one continuous urban complex between them that will fragment the mountain ranges, such as of the Sierra Las Cruces, and eventually making their habitats disappear (Deutsche Gesellschaft für Internationale Zusammenarbeit 2023). The species that inhabit the ranges that surround the Valley of Mexico where Mexico City is located also face the excessive and poorly planned introduction of non-native species such as the Rainbow Trout (*Oncorhynchus mykiss*), which have negative effects on *Dryophytes plicatus* and *Ambystoma altamirani* populations in the Sierra de las Cruces (e.g., Estrella Zamora et al. 2018; Guerrero de la Paz et al. 2020). However, the Mexican government continues to promote expansion programs for Rainbow Trout farms in these areas (García-Mondragón et al. 2013), affecting species endemic to the TVB, mainly those of the genus *Ambystoma* (*A. altamirani*, *A. leorae*, and *A. rivulare* among others) (Estrella-Zamora et al. 2018; Guerrero de la Paz et al. 2020).

Another important threat in this province is the practice at the end of the dry season (March-April) of burning dry vegetation in grasslands and lower parts of the forest layers to produce green shoots to feed livestock, which produces smoke from fires that contribute to contaminating one of the most polluted regions in the country and in the world (i.e., the Mexico City metropolitan area; Rodríguez-Trejo and Cruz-Reyes 2012). In addition, the loss of forests and the pollution that this practice causes significantly damages amphibian and reptile populations. It is common to observe individuals of *Barisia imbricata*, *Phrynosoma orbiculare*, *Sceloporus mucronatus*, etc., without hands or limbs, and snakes such as *Crotalus polystictus*, *C. triseriatus*, or tree frogs such as *Dryophytes eximius*, are frequently found completely burned after these intentional fires (J. Lemos-Espinal personal observation). Unfortunately, all of these threats and an apparent failure to regulate human development in this transition province means that the TVB is in dire need of a comprehensive and effective recovery plan to protect its diverse herpetofauna.

Conclusion

The Transvolcanic Belt (TVB) has an incredible diversity of native amphibians and reptiles, hosting 427 species, including 154 amphibians and 273 reptiles. This represents a significant portion of Mexico's herpetofauna, with the TVB housing 72.7% of the families, 79.4% of the genera, and 30.5% of the species found in the entire country. Among these species, 50 are endemic to the TVB, highlighting the importance of its unique biodiversity. It shares a considerable number of species with neighboring provinces, particularly the Sierra Madre Oriental and the Sierra Madre del Sur, indicating close biogeographic relationships. These provinces serve as sources of species that enter the TVB from various directions, increasing the richness of its fauna. While the TVB exhibits some affinity with eastern Mexico in terms of amphibian species, its reptile fauna reflects a mixture of species from different regions, including western and south-

ern Mexico. However, the conservation status of the herpetofauna of the TVB is of great concern, with a notable percentage of species classified as vulnerable, endangered, or critically endangered. The main threats to these species include habitat loss due to urbanization, agriculture, and pollution, as well as the introduction of non-native species and climate change. Additionally, seven non-native species have been introduced to the TVB, highlighting the need for careful management and conservation efforts. Overall, the TVB stands out as a critical region for the conservation of the unique herpetofauna of Mexico, emphasizing the importance of preserving its rich biodiversity for future generations. Urgent conservation actions are needed to protect the rich and unique herpetofauna of the TVB and ensure their survival in the face of these challenges.

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Additional information

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical statement

No ethical statement was reported.

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Author contributions

Conceptualization: GRS, JLE. Data curation: JLE, GRS. Formal analysis: JLE, GRS. Investigation: GRS, JLE. Writing – original draft: GRS, JLE. Writing – review and editing: JLE, GRS.

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Data availability

All of the data that support the findings of this study are available in the main text.

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Appendix 1

List of the literature sources used to create the species lists of amphibians and reptiles of the Transvolcanic Belt used in the cluster analyses. Source refers to the references from which the checklist for the Transvolcanic Belt biogeographic province was obtained

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Vázquez et al. (2018, 2021); Grünwald et al. (2018, 2019, 2021a, b); Hansen et al. (2016); Hernandez et al. (2022); Hillis et al. (1983); Horowitz (1955); Jameson et al. (2022); Kaplan et al. (2020); Köhler et al. (2019); Lavin et al. (2014); Lemos-Espinal and Dixon (2016); Lemos-Espinal and Smith (2015, 2020a, b, c); Lemos-Espinal et al. (2020); Leyte-Manrique et al. (2022); Loc-Barragán and Woolrich-Piña (2020); Loc-Barragán et al. (2018, 2024); McCranie and Köhler (2004); McCranie et al. (2020); Mendoza-Hernández and Roth-Monzón (2017); Montanucci (1979); Montaño-Ruvalcaba et al. (2020); O'Connell and Smith (2018); Palacios-Aguilar and Flores-Villela (2018, 2020); Palacios-Aguilar and Santos-Bibiano (2020); Palacios-Aguilar et al. (2018); Pazos-Nava et al. (2019); Pérez-Ramos and Saldaña-de la Riva (2008); Platz (1991); Ramírez-Bautista et al. (2020); Ramírez-Reyes and Flores-Villela (2018); Ramírez-Reyes et al. (2017, 2021a, b); Reyes-Velasco et al. (2020a, b); Schätti et al. (2020); Streicher et al. (2014); Tepos-Ramírez et al. (2021); Torres-Hernández et al. (2021); Valencia-Herverth et al. (2020); Webb (2001); Woolrich-Piña et al. (2016, 2017a); Zaldivar-Riverón et al. (2004)